Vol. 2 TECHNOLOGY DEPARTMENT DECEMBER, 1920 First Copy No. 9

THE PAPER INDUSTRY

The Monthly Educational Journal of the Paper Industry.

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INCORPORATED
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NEW YORK

Our best and whitest South Carolina clay shipped pulverized, or cracked down to small lumps.

Especially satisfactory for bag or board coating, or for paper filling.

A white pulverized clay from our mine in Virginia.

Dried to a moisture content of about 3 per cent.

Suitable for coating book paper and filling book paper.

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Clay Mines in Georgia, Virginia, South Carolina, Pennsylvania, Etc.

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SPECIAL GRADES FOR LINING DIGESTERS
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(CALCINED SULPHATE OF SODA)

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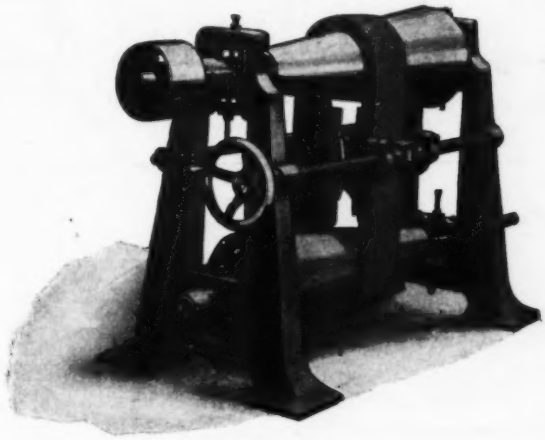

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Any horsepower 1 to 200.

Variation of speed may be made while machine is in operation. No time lost.

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PHILADELPHIA, U. S. A.

Vol. 2—No. 9

THE PAPER INDUSTRY

A. SCOTT DOWD
Editor

A MONTHLY EDUCATIONAL JOURNAL
Devoted to the Interests of the Pulp and Paper Industry

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comprising all and every Sulphite, Sulphate and Kraft pulp mill in Finland. Manufacturers of superior grades of Bleached and Unbleached Sulphites, Easy Bleaching Sulphates and Kraft Pulps.

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How Zaremba engineers provided a valuable development to the Paper Pulp Industry forms an interesting story—a story that has parallels only in Zaremba Co.'s achievements in other fields.

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The use of resinous woods, such as Jack Pine, has been neglected, and in some cases prohibited because of the liquor loss from severe foaming. Recognizing the tremendous utility of an evaporator which could handle foaming liquors properly, Zaremba engineers devised the Hughes Foam Arrester which is now being furnished with soda and sulphate pulp installations. The success of this apparatus demonstrates the extent to which the Paper Pulp Industry is indebted to our engineers.

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The greatest achievement of Zaremba Company—that of producing evaporators that have a well known reputation for long life, hard service and no worry to the owner—has been made possible by our policy of combining the best results of old practice with the latest improvements of value.

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Outlast the Factory

STEAM—ACIDS—WATER—WEAR

Have no effect on **Kreolite Wood Block Floors.** Engine, digester, beater, machine, finishing and shipping rooms require different types of **Kreolite Wood Blocks** for permanent service. Hundreds of thousands of square feet of **Kreolite Block Floors** are being used by the leading, up-to-the-minute Paper Mills and Plants of America.

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Own Your Own Truck Filling Station

Buy gasoline and oil in bulk, at quantity prices, and save on the cost of these two big items in trucking operation.

Keep them free from waste, dirt, evaporation and fire in Wayne Storage Tanks.

Get them to every truck in the fleet in the most time, labor and material saving way—with a Wayne Pump installed on your loading platform. Operated by a boy. Speedily and precisely measures and dispenses any quantity at a crank turn. Automatically computes the amounts used and gives you accurate fuel consumption records on each truck.

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Get full facts today. When writing ask for bulletins Nos. 207 PI, 65 PI and 227 PI.

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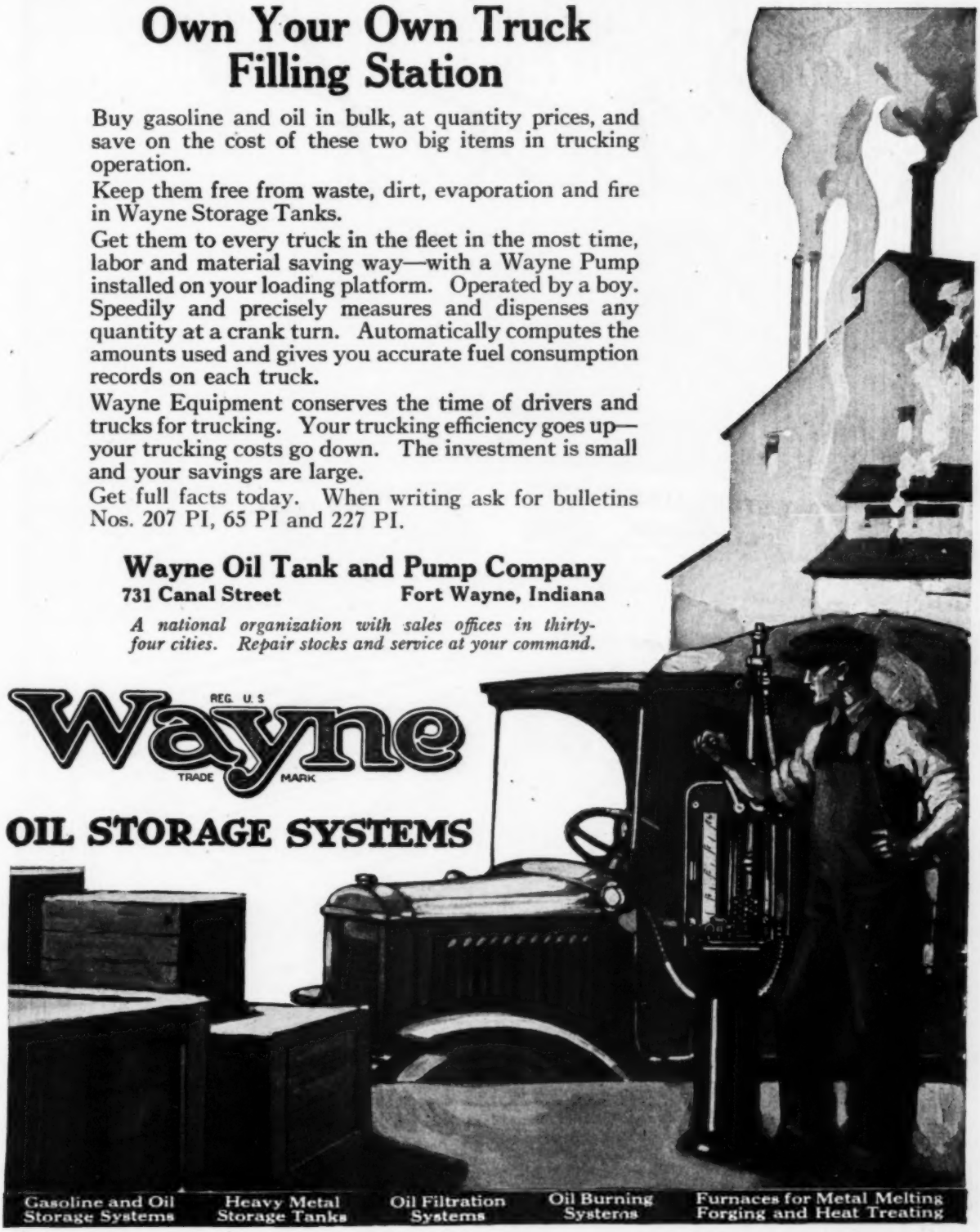
731 Canal Street **Fort Wayne, Indiana**

A national organization with sales offices in thirty-four cities. Repair stocks and service at your command.



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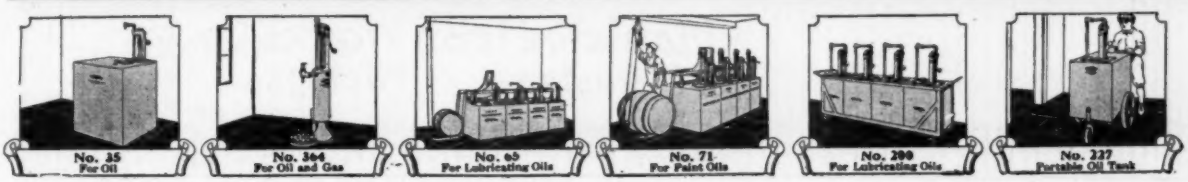
Gasoline and Oil Storage Systems | Heavy Metal Storage Tanks | Oil Filtration Systems | Oil Burning Systems | Furnaces for Metal Melting Forging and Heat Treating



Proof!

WESTERN UNION TELEGRAM

RECEIVED AT

23 CHD 15 COLLECT HERKIMER N.Y. 936 AM JUNE 19TH
MANISTEE IRON WORKS COMPANY
MANISTEE MICH.
ROTURBO CONDENSER ENTIRELY SATISFACTORY TWENTY SEVEN
AND ONE HALF TO TWENTY NINE INCH VACUUM.
MUNICIPAL COMMISSION 9:47 AM

WESTERN UNION TELEGRAM

RECEIVED AT

19RED 10 KALAMAZOO MICH 940 AM JUNE 19TH
MANISTEE IRON WORKS COMPANY
MANISTEE MICH
WE CONSIDER YOUR VACUUM ROTURBO CONDENSER ONE HUNDRED
PERCENT EFFICIENCY.
KALAMAZOO VEGETABLE PARCHMENT CO.

WESTERN UNION TELEGRAM

RECEIVED AT

32 D 25 COLLECT CROSBY MICH. 840PM JUNE 21ST
MANISTEE IRON WORKS COMPANY
MANISTEE MICH.
OUR EXPERIENCE WITH ROTURBO CONDENSER VERY SATISFACTORY
MAINTAINING BETTER THAN TWENTY EIGHT INCHES CONSTANTLY
GLAD TO HAVE YOU REFER A POSSIBLE CUSTOMER TO US.
CROSBY MFG. CO.

WESTERN UNION TELEGRAM

RECEIVED AT

30 CHD 20 COLLECT HOLLAND MICH 9:16 AM JUNE 19TH
MANISTEE IRON WORKS COMPANY
MANISTEE MICH
CONDENSER IS WORKING SATISFACTORILY TWENTY SEVEN AND
NINE TENTHS INCHES VACUUM AT TWENTY NINE AND ONE HALF
INCH BAROMETER
BOARD OF PUBLIC WORKS CO 11:14AM

WESTERN UNION TELEGRAM

RECEIVED AT

47 CHCU 30 COLLECT
ELIZABETH NJ 9:36A JUNE 19 1920
MANISTEE IRON WORKS COMPANY
MANISTEE MICH.
ROTURBO CONDENSER TESTING WATER AT SIXTY SEVEN DEGREES
FAHRENHEIT TWELVE FOOT TEMPERATURE HUNDRED SEVENTY FEET OF
EIGHT INCH PIPE WITH FOUR RIGHT ANGLE BENDS EIGHTY DEGREES
VACUUM TWENTY SEVEN AND HALF INCHES UNIT ELBOWS MAINTAIN
WAS CLAIMED FOR IT. WE ARE SATISFIED WE USE GOOD JUDGE-
BEST WHEN INSTALLING SAME
...ITTER LBR. CO. 9:30 AM

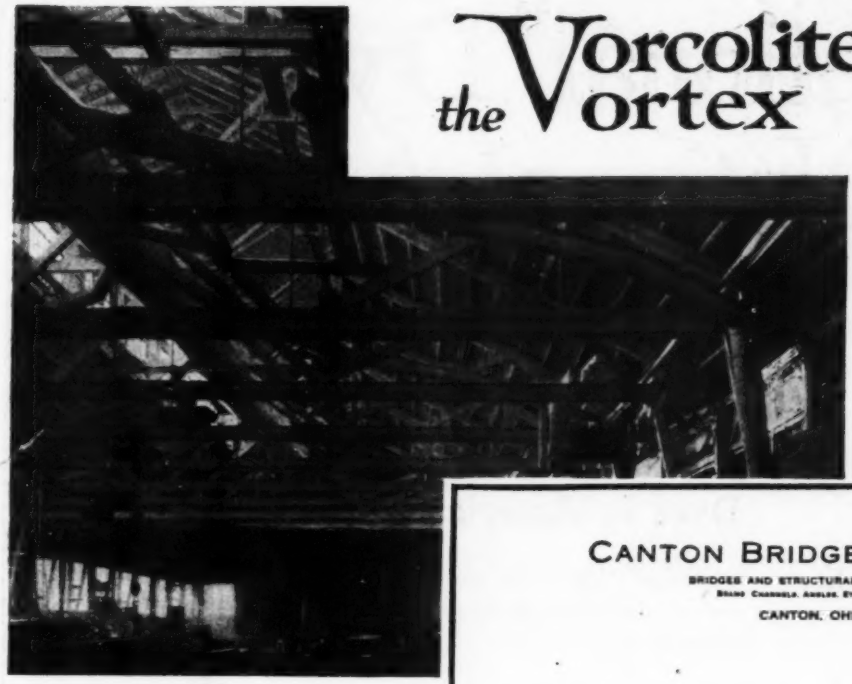
WESTERN UNION TELEGRAM

RECEIVED AT

58CH JO 18 COLLECT
PETOSKEY MICH. 5:12 PM JUNE 18 1920
MANISTEE IRON WORKS COMPANY
MANISTEE MICH.
OPERATION SATISFACTORY VACUUM UP TO 27 INCHES VERY RELIABLE
NO TROUBLE OR REPAIRS SINCE INSTALLED
PETOSKEY WATER LIGHT DEPT.
5:46 PM

Manistee Iron Works Co.
Manistee Michigan
Manufacturers of the ROTURBO Condenser.

A Customer Wrote this Ad for the Vorcolite Paint & Vortex Painter



"ON THE WALL" PAINT ECONOMY

Paint at the time that suits you with your own labor, a private Vortex equipment and Vortex paints. The Vortex Painter is shipped to you under perpetual lease, either with or without air compressor.

Other concerns make cheaper paint, in the can, than Vortex paints, for quality has never been sacrificed in our product; but on the wall, where the paint finally arrives and serves, the argument of quality and economy are both on the side of Vortex painting.

CANTON BRIDGE COMPANY

BRIDGES AND STRUCTURAL IRON WORK

Beams, Channels, Angles, Etc., in Stock

CANTON, OHIO

January 3, 1920

Vortex Mfg Co.,

Cleveland, O.

Dear Sirs;-

We wish to express ourselves as more than satisfied and pleased with the operation of your "Vortex Painter" equipment and the application of VORCOLITE to the interior of our Canton plant. We cannot too highly recommend VORCOLITE as a one application paint for factory interiors. It certainly has done wonders for us and has surely turned our plant from darkness to daylight. For the first time in many years, we are able to work in our plant without the use of artificial light which was never possible before using your material and your equipment.

This work was done without the interruption of any of our plant activities, and with only slight inconvenience to us, -- having been completed in about one fourth of the time it would have taken for a brush coated job with double the number of men employed by you. Besides, we know from actual experience that one application made with your appliances and paint makes a whiter job than two applications with brushes

Yours very truly,

CANTON BRIDGE COMPANY

By [signature] Sec'y & Treas.

P. S You may consider yourselves at liberty to send anyone to our plant at any time who may care to inspect the work done here for us

The VORTEX MANUFACTURING CO · CLEVELAND · O

"National" Dyes are National Assets

NATIONAL U.S.A. DYES

The Largest Makers of Coal-Tar Dyes in America

Quality "National" Dyes are not placed on the market until their quality has been finally determined.

Service The technical service of the Company is at the disposal of its customers without charge. Shade Cards, containing colors produced under actual dyeing conditions of the various trades, are prepared regularly and distributed to all interested in dyestuffs.

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National Aniline and Chemical Co. Inc.

General Offices—21 Burling Slip, New York

Quality

EDITORIAL

A Merry Christmas

CHRISTMAS is here!—but some are glad it comes but once a year. With others, however, the occasion is the most lovingly anticipated event of the year and preparations are made far ahead of the time. Many wait until they are caught up in the wave of enthusiasm which begins a fortnight before and then join the throng of merry cheer-givers.

Man, as a rule, makes an effort about the first of November to reconcile himself to what he believes he can't do in the way of Christmas beneficence. He decides to bestow gifts upon none but the members of his immediate family, and to minimize that amount as much as he can.

His reasons are the "High Cost of Living," the "Uncertain Future," and—"Oh, well! This giving of presents is a bad habit anyway."

As the time draws nearer to hand, however, the psychology of the Christmas season becomes very powerful—love fills the air—the mass-enthusiasm gets a hold on him—he is unable to resist it.

He sees the manifestation of this love-spirit in every one's face as he passes along the street. The glow of eager expectancy in the faces of children makes him remember his childhood faith in old Santa Claus. The happiness abounding among men and women of the throng as they wend their way homeward with their arms laden with bundles; the inviting displays of wonderful gifts and the beautiful festive decorations; the inspiring subjects in painting and sculpture on exhibition in the art stores; the sumptuous eatables so temptingly arranged; music everywhere; the thrill which vibrates through the body as the friend grasps the hand and says, "Merry Christmas, Old Man"—why, the world isn't so bad, after all; he is rich and he didn't know it.

He begins to think of poor families who are deprived of these Christmas blessings, and he immediately plans to contribute to their happiness.

He realizes that this Christmas season belongs to little children, and except that he is like unto them, he "cannot enter into the kingdom of Heaven."

As the time grows shorter, he feverishly gets busy, and orders a gift to be sent here and one there; toys for his friends' children and candy for the little girls. He selects with care the choice gifts for his home circle and loads his arms with delicious things for the table. He does more than he can afford, but not more than he should.

He is the expression of good cheer about his office, and every one participates in the warmth of his good-fellowship.

On Christmas eve, and the children in bed, he proceeds in company with his wife to decorate the Christmas tree and to arrange the greens and the ribbon—and as the bright candle is put into the front window to light the way for the Christ-Child, he thanks the giver of all good things that the star of love was revealed to him and that by it he was guided to the birth of true happiness.

In this same spirit of love and thankfulness, the Paper Industry extends to all its readers and friends its best and most cordial wishes for a Merry Christmas and a Happy New Year.

Heavy Duty White Truck, one of eighteen Whites owned by The Great Northern Paper Company, hauling pulp wood to the mills at Millinocket, Maine

Great Northern Paper Company Owns Eighteen Whites

A FLEET of eighteen White Trucks, the oldest units of which have seen more than seven years' service, is owned and operated by The Great Northern Paper Company. These trucks carry food and supplies to the company's sixty logging camps scattered throughout Maine, and haul pulp wood from the camps to the mills at Millinocket, East Millinocket, Madison and Bangor.

"We have found White Trucks to be dependable and efficient," says Mr. Hilton, of the company's division of forest engineering. "Besides their dependability, they do their work forty per cent cheaper than the same work was formerly done with horse-drawn equipment."

White Trucks hold a position of leadership in the paper industry and many of the most experienced truck operators in this field have standardized on them. They are given every preference by these owners because of their adaptability to the wide range of service necessary in this industry, and their ability to do the most work for the least money.

THE WHITE COMPANY
CLEVELAND

White Trucks

The Copes Succeeds

where all ordinary Boiler Feed Regulators have failed

IT IS ABSOLUTELY RELIABLE AND SAFE

Direct, Positive, Automatic in Action and of Simple, Sturdy, Rugged Construction

A straight tube, a lever, a heavy iron base, and a practically frictionless balanced valve—that's all there is to it, as you will see in the illustration.

Built strong from the best materials obtainable and developed along scientific lines, it is the most efficient and durable means ever offered for mechanical feed water regulation.

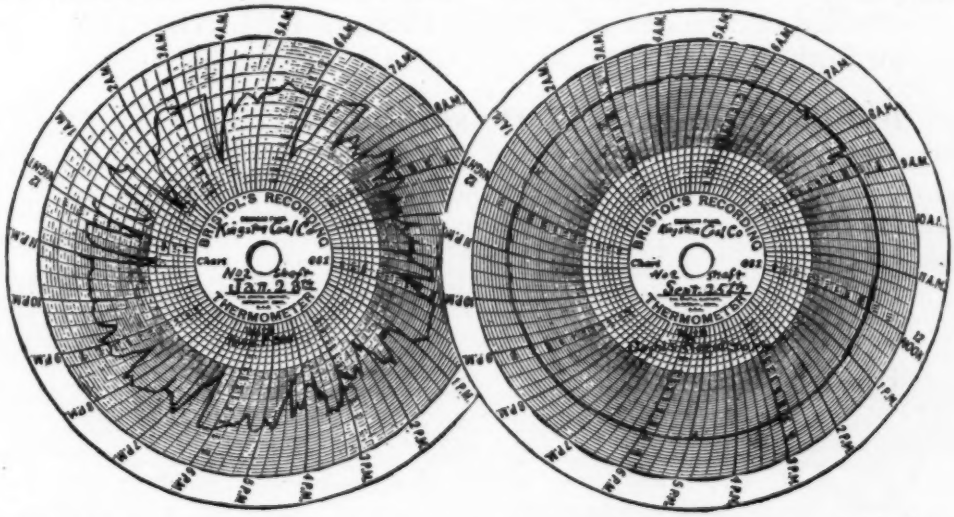
Since it is designed on correct principles, there are no complicated, sensitive contrivances of uncertain reliability, nor weak, delicate parts subject to wear and likely to go wrong at the critical moment. In other words, there are no floats, generators with boiling liquids, displacement bodies, diaphragms, needle or pilot valves, springs or other attachments to require constant watching, renewals, adjustments and unexpected repairs.

Once installed, cut into service and adjusted by the user, further attention is seldom required by the Copes, and the first cost is usually the only cost, no further outlays or maintenance expense being called for. As one prominent chief engineer stated, "I selected the 'Copes' because it is simple and rugged,—everything is on the outside, our tests substantiated every claim made for the regulators."

The operation is entirely automatic, and not affected by the steam pressure, the rate of feed being varied to insure the highest economy in steam making where furnace conditions are bound to lag behind extremely irregular and unexpected fluctuations in the boiler load.

Hand regulation cannot possibly give economical results because the operator does not know until the gauge glass tells him a long time afterwards what is going on inside the boiler at any given time. The Copes automatically responds instantly to every fluctuation in the boiler load. It stores heat when heat should be stored. It utilizes all available heat for steam making when that is necessary.

The two charts shown below are typical "before and after" records where hand regulation was superseded by Copes regulation. The left hand diagram, a record of hand regulation, shows an average feed water temperature of only 178° F. The right hand diagram, the result of Copes regulation, shows an average feed water temperature of 210° F.



The Copes therefore increased the average feed water temperature 32° F. This is equivalent to a saving of 3% of fuel.

Besides saving fuel and labor, and increasing boiler capacity, the Copes insures constant steam pressure, equalizes boiler load, makes meter charts legible, reduces wear and tear on piping, produces dryer steam, increases superheat and frequently raises by 30% to 100% the peak load capacity of a boiler plant.

Write for Our Bulletin I, Giving Full Particulars

NORTHERN EQUIPMENT CO.

The World's Largest Manufacturers of Feed Water Regulators

104 West 11th Street **Erie, Pa.**

95

BAGLEY

STANDS FOR

Quality!

Efficiency!

Progress!

Reliability!

In that the QUALITY of our manufactures insures greater EFFICIENCY in the output of your manufactures and establishes a record of PROGRESS and RELIABILITY for both of us.

We have for immediate shipment

Two 12"x12" TRIPLEX STUFF PUMPS, the famous "Bagley Throbbers," for pumping from 40 to 70 tons of paper daily.

Also

One 8"x16" DUPLEX STUFF PUMP for pumping from 20 to 30 tons of paper daily.

We have in stock

All sizes of Fan and High Efficiency Centrifugal pumps from 4" to 12" and carry a large supply of Quick Opening Removable Top Slide Lever Gate Valves in stock from 3" to 12" for immediate shipment.

We now manufacture

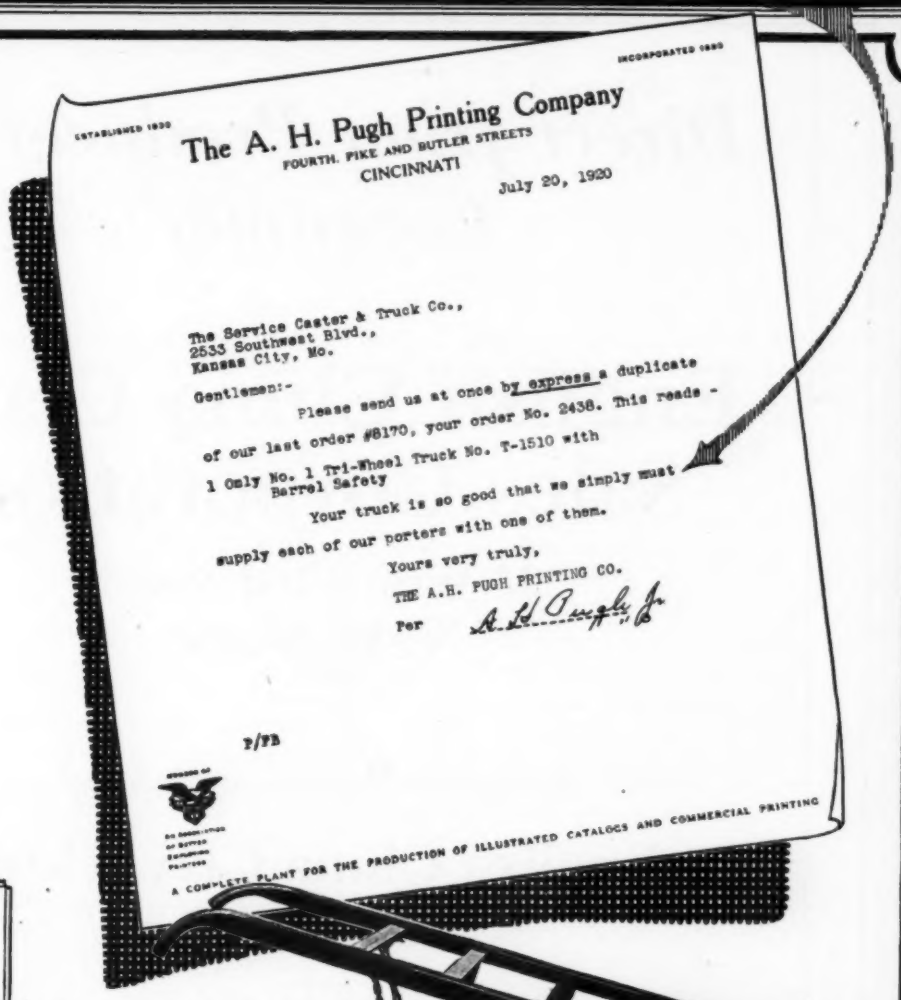
HARMON SCREENS, admitted to be the best flat and inclined screen on the market. The Harmon Inclined Screen is the *only* Inclined Screen and we own the exclusive patents.

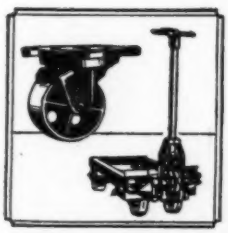
We are Builders of FOURDRINIER, CYLINDER, HARPER FOURDRINIER and YANKEE PAPER MACHINES

The Bagley & Sewall Company

Watertown, New York, U. S. A.

"A Tri-Wheel Truck for each porter"


ESTABLISHED 1920
INCORPORATED 1880
The A. H. Pugh Printing Company
FOURTH, PIKE AND BUTLER STREETS
CINCINNATI
July 20, 1920
The Service Caster & Truck Co.,
2533 Southwest Blvd.,
Kansas City, Mo.
Gentlemen:-
Please send us at once by express a duplicate
of our last order #8170, your order No. 2438. This reads -
1 Only No. 1 Tri-Wheel Truck No. T-1510 with
Barrel Safety
Your truck is so good that we simply must
supply each of our porters with one of them.
Yours very truly,
THE A.H. PUGH PRINTING CO.
Per
P/FB
A COMPLETE PLANT FOR THE PRODUCTION OF ILLUSTRATED CATALOGS AND COMMERCIAL PRINTING



Service Casters and the Service Elevayor Truck are other units of Service equipment which are making for better transportation in countless establishments. Let us show wherein they are most economical for you to use.

The Service Tri-Wheel wins such letters of commendation because it's a happy combination of a two wheel, one-man, truck and a platform truck. With a Tri-Wheel, one man can "break over" a load that would require two men using an ordinary two wheel truck.

The Service Tri-Wheel is a great saver of your truckman's energy since it carries *all* the weight of the load.

We'll be pleased to send descriptive literature.

The Service Caster and Truck Co.
Kansas City, Mo.

Sales Office
Transportation Bldg.
Chicago, Ill.

Sales Representatives in Principal Cities

SERVICE

CASTERS TRUCKS

Direct from Producer to Consumer

English China Clays Sales Corporation

33 West 42nd Street
New York

Exclusive Representatives of

English China Clays, Ltd.
St. Austell, England

Largest China Clay Producers in the World

500,000 Tons Annually

ECCO CLAYS TRADE MARK

Paper Vases

An Editorial by R. L. S.

A VASE is a container of usefulness and beauty. There are all kinds and sorts of vases in the world's market, but perhaps one of the most far reaching of them all is the paper vase. It is not only made in many shapes, but utilized to hold florescence of all descriptions giving forth perfumes of various qualities.

For instance, there is the newspaper vase holding the blossoms of editorial and typographical effort. Some of these efforts are very young, mere buds, and quite green; others are stiff and stale. Some are red with sensation, while others are yellow with vociferous jaundice. Again, others are dark with useless records of crime. Why should a newspaper man keep his vase filled with flowers that give off nothing but bad odor?

Another style of paper vase extensively used is the bookbinder's vase. In this vase are put the flowers of the author's garden that the world may share what has grown in the writer's thought. It would seem that some people are very careless as to what they grow in the garden of their mind. Again, some seem to have given their whole space to grow just common pig weeds and pusley. But there are those who use the hoe vigorously in their thought, seeking to offer the world only cultivated blooms of refined helpfulness to rest the weary and give the busy man from the day's work recreative entertainment.

Then there is the stationery vase in which the friend places the flowers of affection expressed in perfumed sprays of friendly correspondence. This vase like the other is sometimes misused, but if we get the right viewpoint, we shall never put anything in this vase which will soil either the paper or the mind which gets the message.

Then there is the paper packing vase into which the manufacturer puts the flowers he has grown. Also the wrapping paper vase in which the merchant handles his product. When all these vases and numerous others we might mention are utilized as they should be, as any self-respecting vase would like to be, the world will be a far better place.

So, Mr. Vasemaker, you are in a great business, and though you may never have thought of it in that light, it is highly important what kind of material you yourself are putting into the shaping and mental makeup of these paper vases. Are you seeking to make your concern the most efficient, and to keep your business fragrant with good nature and cooperative endeavor? What are you putting into your PAPER VASES?

Oxford Paper Company

Mills at
RUMFORD
MAINE

Executive Offices
200 Fifth Avenue
NEW YORK

Manufacturers of

High Grade Machine Finish and Super-Calendered Book Papers

CAPACITY OF MILL, 275 TONS OF PAPER PER DAY

Nashwaak Pulp & Paper Co. Limited

Manufacturers of

P

Canadian Bleached Sulphite

Mills: St. John, N. B., Canada

GENERAL SALES OFFICE
200 Fifth Avenue NEW YORK

Maine Coated Paper Co.

Manufacturers of

Polar, Hi-Tone and North Star Coated Book Papers

ALSO

Coated One or Two Sides Lithograph and Cover

Mills: Rumford, Maine

New York Sales Office: 200 FIFTH AVE.

Season's Greetings

AND AN EXPRESSION OF APPRECIATION ARE EXTENDED TO OUR MANY FRIENDS WHO HAVE ENABLED US TO BRING TO A SUCCESSFUL CONCLUSION OUR SECOND CALENDAR YEAR

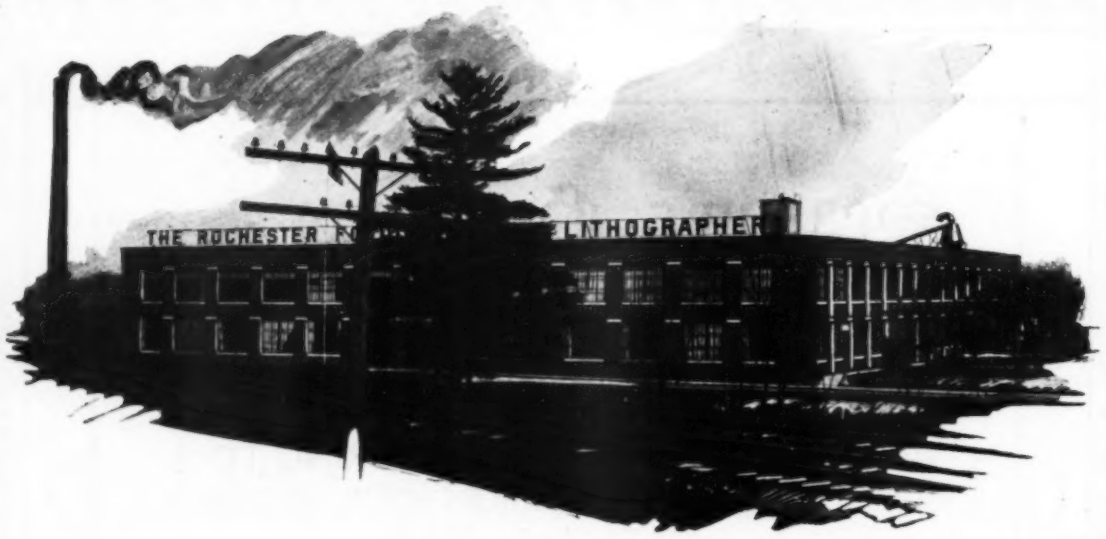
Strehl Otens Company

INCORPORATED

Paper Boards and Specialties

NEW YORK
Fifth Avenue Building

CHICAGO
First National Bank Building



The Rochester Folding Box Company, Rochester, N. Y., depend upon Sirocco and A B C equipment to help maintain the high quality of the product.

Materials and Men

The things of standing importance today are materials and men.

The quality of material turned out in your plant has all to do with the reputation on which your business stands.

High quality is only possible with good material and good workmanship. In the Paper Industry quality of the product is improved and the men enjoy better working conditions through the installation of the right type of ventilating equipment—A B C and Sirocco products. The Rochester Folding Box Company, one of the East's most progressive and aggressive firms use Sirocco products for conditioning the air in making folding box board.

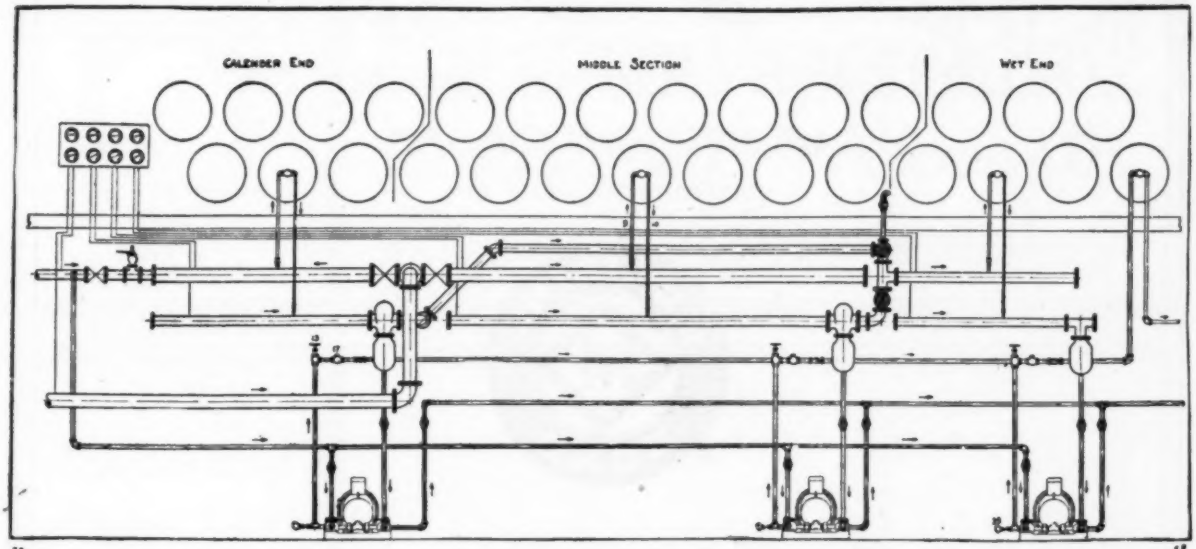
This whole subject of ventilating, heating and air conditioning in paper mills is covered in detail in our bulletin in A B C Equipment for Paper Mills. Would you like a copy?

American Blower Co.
DETROIT MICHIGAN

"Sirocco"
TRADE MARK

Driven side of "A B C" air conditioning apparatus and outlet for distribution of conditioned air.

The Crane Drying System Increases Production!



The Crane System of Circulation and Drainage Control (Patented.)

Rapid circulation of steam is necessary to maintain uniform heating conditions in all the dryers of a paper machine.

In many drying machines steam will blow through the calender dryers, retarding the flow of condensation at the wet end, because the drop in pressure is less at the calender end than at the wet end.

The Crane System of Circulation and Drainage Control solves this problem by utilizing the steam in the return header of the dry end of the machine as a source of supply for the wet end dryers. The condensing power of these dryers is sufficient to maintain at all times a pressure in the return header low enough to secure rapid circulation of steam without waste.

SALES OFFICES, WAREHOUSES AND SHOWROOMS:

BOSTON, SPRINGFIELD, HARTFORD, BRIDGEPORT, ROCHESTER, NEW YORK, ALBANY, BROOKLYN, PHILADELPHIA, READING, NEWARK, CAMDEN, BALTIMORE, WASHINGTON, SYRACUSE, BUFFALO, SAVANNAH, ATLANTA, KNOXVILLE, BIRMINGHAM, MEMPHIS, LITTLE ROCK, MUSKOGEE, TULSA, OKLAHOMA CITY, WICHITA, ST. LOUIS, KANSAS CITY, TERRE HAUTE, CINCINNATI, INDIANAPOLIS

FOUNDED BY R. T. CRANE, 1855

CRANE CO.

836 S. MICHIGAN AVE.

CHICAGO

WORKS: CHICAGO AND BRIDGEPORT

DETROIT, CHICAGO, ROCKFORD, OSHKOSH, GRAND RAPIDS, DAVENPORT, DES MOINES, OMAHA, SIOUX CITY, ST. PAUL, MINNEAPOLIS, WINONA, DULUTH, FARGO, WATERTOWN, ABERDEEN, GREAT FALLS, BILLINGS, SPOKANE, SEATTLE, TACOMA, PORTLAND, POCATELLO, SALT LAKE CITY, OGDEN, SACRAMENTO, OAKLAND, SAN FRANCISCO, LOS ANGELES

CRANE LIMITED — MONTREAL, TORONTO, VANCOUVER, WINNIPEG, LONDON, ENG., SYDNEY, N. S. W., QUEBEC, HALIFAX, OTTAWA, REGINA, CALGARY.

We are manufacturers of about 20,000 articles, including valves, pipe fittings and steam specialties, made of brass, iron, ferrosteel, cast steel and forged steel, in all sizes, for all pressures and all purposes, and are distributors of pipe, heating and plumbing materials

MUNISING PAPER COMPANY

MUNISING MICHIGAN

MANUFACTURERS OF

MUNISING M BOND

COLOR QUALITY AND UNIFORMITY
HAVE MADE FOR IT
AN ENVIABLE REPUTATION

SALES SERVICE

FOR

PAPER MANUFACTURERS

It is well to have behind one's business the sales energy and distributing resources of an organization equipped with ample facilities to render the fullest measure of service.

We Offer Paper Manufacturers the Best Existing Sales and Distributing Service, Backed by the Experienced and Able Co-operation of an Organization of Large Capacity

Berton C. Hill Company
INCORPORATED

PAPER MANUFACTURERS' SELLING AGENTS

Astor Trust Building
501 FIFTH AVENUE at 42d STREET

Telephones 4784 and 5986 Vanderbilt
NEW YORK CITY

Marathon Paper Mills Co.

Rothschild—Wisconsin

Paper Manufacturers

Carton and Paper Can Stock

Sulphite Bonds
Waxing Papers
Bleached-Specialties

Machine Glazed Plain and Watermarked Specialties

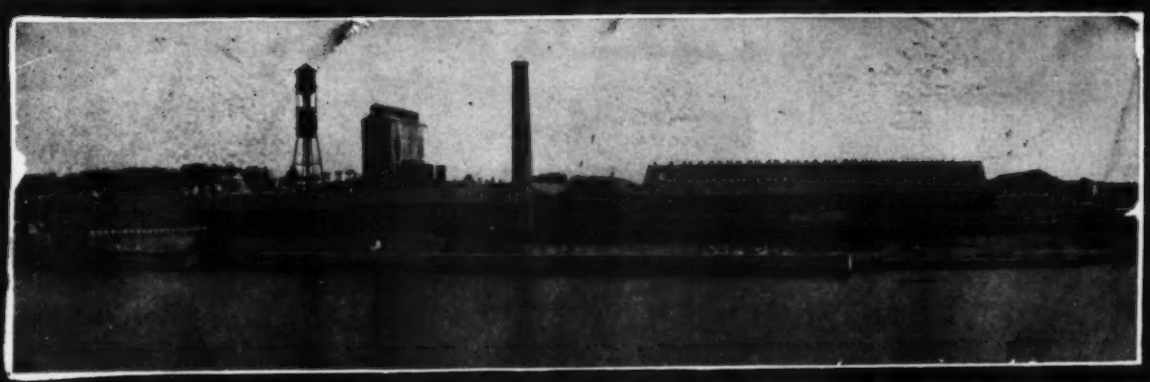
¶ One 100-inch Cylinder Machine, producing Solid Manilas, Single Lined and Double Lined Boards for Carton and Paper Can purposes.

¶ One 120-inch Fourdrinier Machine, producing Sulphite Bond, and Bleached Papers for special conversions purposes.

¶ Two 120-inch Yankee Machines, producing Machine Glazed Papers in Plain and Special Stock Designs, as well as Special Watermarks.

Daily Production, 200,000 lbs.

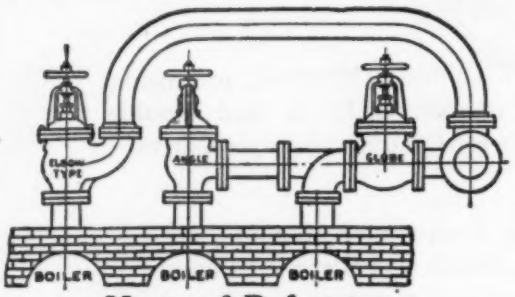
SALES OFFICE
CONWAY BUILDING,
CHICAGO



Consider the Lives of Your Men and Protect Your Property

When a Boiler Tube or Steam Main bursts they are safe if you have

Golden-Anderson
Life *and* Property Insurance Valves



Hosts of References
"1960 Used by U. S. Steel Corp."

1. Automatically cut a boiler out of service the instant that a tube or other internal rupture occurs.
2. The triple acting style will also automatically shut off every boiler the instant that a steam pipe bursts.
3. Automatically equalize the pressure between all boilers and make steam flow into a cold boiler impossible.
4. Double cushioned by double Corliss Dash Pot that eliminates all pounding, spinning and sticking.
5. *The only valves that can be tested from the boiler room floor.*
6. Can be controlled from distant points by electricity or steam.

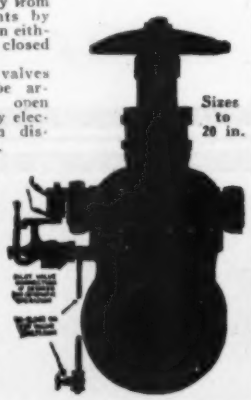
The Combination Valves Can Also Be Opened and Closed with a Hand Wheel

"No Shut-Down When a Tube Bursts"

Golden-Anderson

Patent Double Cushioned Quick Closing Emergency Trip Valves

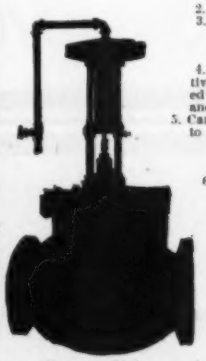
1. They can be tripped instantly from distant points by electricity on either open or closed circuits.
2. The only valves that can be arranged to open and reset by electricity from distant points.
3. Fitted with Corliss dash pot that insures perfect cushioning.
4. Operate without springs or tight fit ting parts.
5. The H. C. Frick Co. have given 150 repeat orders.

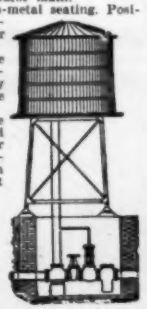


Golden-Anderson

Patent Automatic Cushioned Controlling Altitude Valves

1. Eliminate loss of water in reservoirs, stand-pipes, tanks, etc., by keeping the level constant.
2. Operate without floats or fixtures.
3. Uninterrupted service and a positive water supply assured without danger of water hammer surges or burst main.
4. No metal-to-metal seating. Positively cushioned by water and by air.
5. Can be made to close automatically during fire service.
6. Can be controlled by water or electricity from distant points.





Golden-Anderson

Patent Automatic Cushioned Float Valves

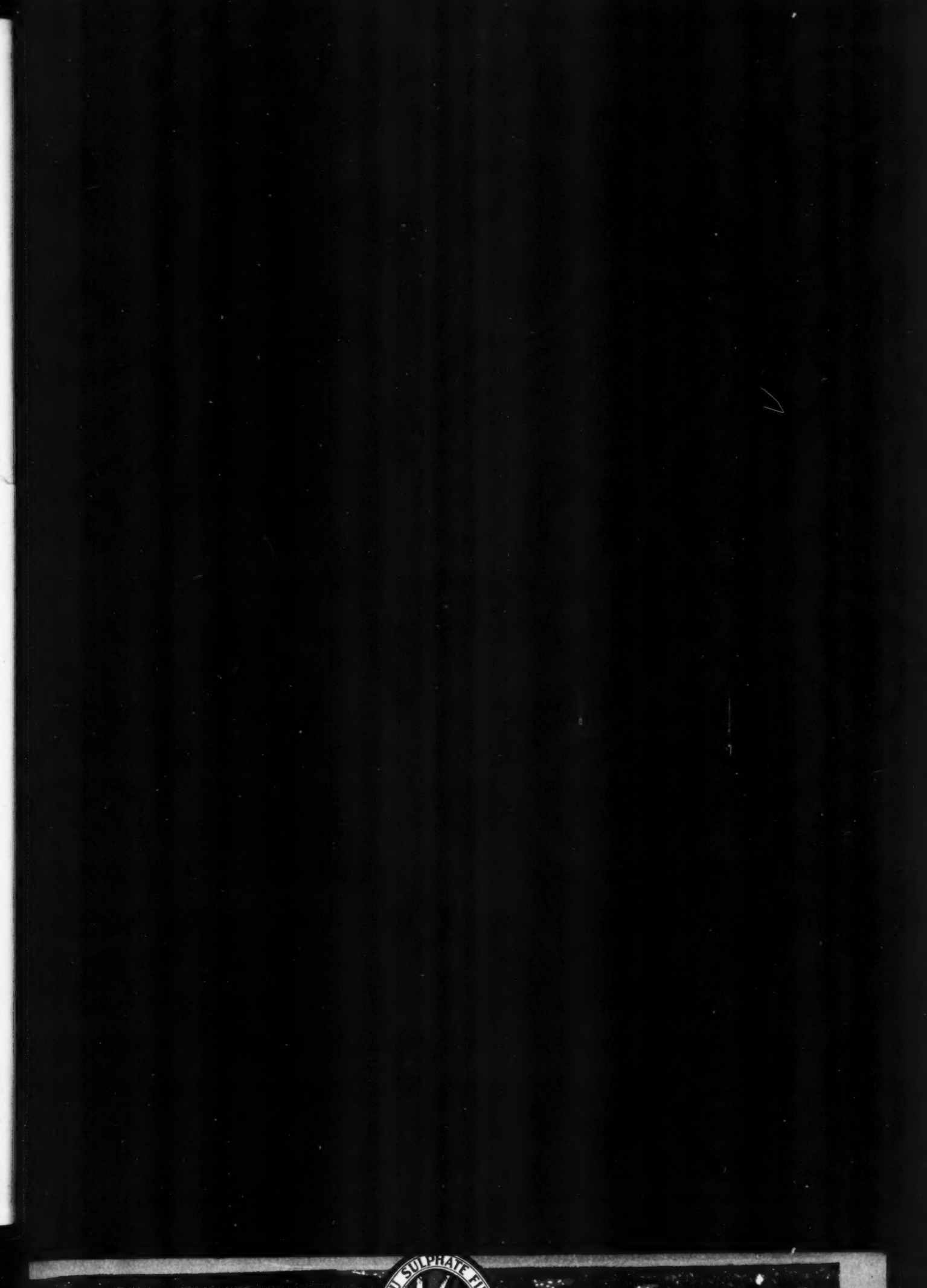
1. Accurately control the water level within two predetermined fixed levels.
2. Seat positively tight when closed.
3. Need minimum attention in service.
4. Double cushioned by water and air.
5. Can be adjusted to operate quickly or slowly.

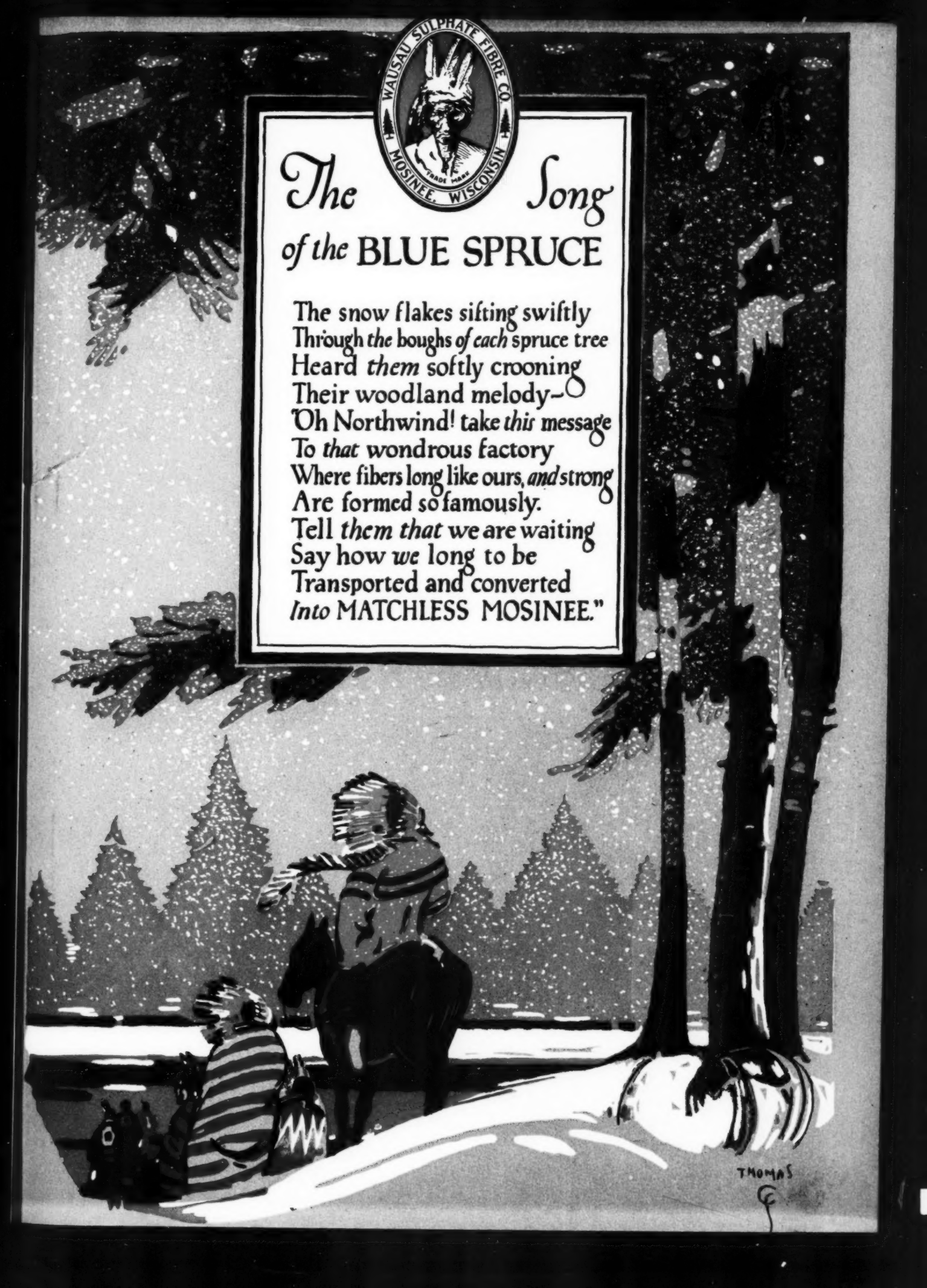
"Every Valve with an Absolute Guarantee"

"Hosts of References"

GOLDEN-ANDERSON VALVE SPECIALTY COMPANY

1240 Fulton Building, Pittsburgh, Pa.




WAUSAU SULPHATE FIBRE CO.
MOSINEE, WISCONSIN
TRADE MARK
The Song of the BLUE SPRUCE
The snow flakes sifting swiftly
Through the boughs of each spruce tree
Heard them softly crooning
Their woodland melody—
"Oh Northwind! take this message
To that wondrous factory
Where fibers long like ours, and strong
Are formed so famously.
Tell them that we are waiting
Say how we long to be
Transported and converted
Into MATCHLESS MOSINEE."
THOMAS

MOSINEE

The
Wrapping
Paper
That Delivers
the Goods

Made by

The Wausau Sulphate Fibre Company

MOSINEE, WISCONSIN

Chicago Sales Office—1625 Conway Building

Don't Be a Bear on the Paper Market

THE printer said to our representative the other day "What is the reason paper prices do not come down faster, and how can they be expected to stay high and rule firm when so many other commodities have declined so drastically?" He said a lot more, but we have quoted above the nub of his query.

Of course, there is a reason.

It ought to be apparent by this time to men who possess gray matter above the earline that all the "bull con" in the world could not maintain the price of any commodity in face of this most violent and general deflation which has dragged most materials, even essential and basic ones, down in price even below pre-war levels in some cases. This is not a "boot-strap" market, nor a "shot in the arm" proposition.

It is not the amount of talk, nor the bulk of market opinion for or against any commodity that causes its price to crumble or hold firm in times like these. Prices are fixed by the operation of that natural law that governs all barter and exchange, the law of supply and demand. Acquaint yourself with the supply sources and conditions of any basic commodity and you will, if you get the facts correctly, perceive just why the prices of that commodity have either crumbled or remained firm. If the raw materials sources are large and the supply plentiful, heavy and pressing for sale, you will find in every case that the market price has crumbled and the demand declined. On the other hand, if you find that the raw material sources of a commodity are diminished, the supply is low and the production conditions showing a decline, you will find that the prices of that commodity are holding firm and slow to yield to a slackened demand.

As illustration of those commodities whose decline has come about because of over-supply conditions, we cite: woolens, cottons, leather goods, sugar, flour and meat products; and as an illustration of those commodities whose prices have held comparatively strong (while others declined) due to under-supply of raw material, we cite woodpulp papers.

Lack of space prevents our giving an analysis of each of the commodities cited, so we will merely instance one, the wool situation.

Wool had its decline. It was inevitable.

During the war the government said to us: "Don't buy woolen garments, the soldier boys need all the wool clothing." We ceased buying woolen goods. They also said to the wool grower: "Produce all the wool you can and we will pay you the highest fixed price (artificial) you ever got for all of it." The wool men went to it and for three years produced the biggest wool clips known.

Then came the armistice; suddenly, the governments began to cancel contracts. They said the time had arrived when the law of supply and demand must rule. Civil population needed wool garments of all kinds and during 1919 they replenished their depleted supplies from their large earnings. Then came the large excess production of wool on the market, and manufacturers began to shade prices. The demand for $150.00 suits from workingmen stopped; enormous accumulated supplies of raw materials from all parts of the world pressed on the market. Great stocks of finished cloths sought buyers at sinking prices.

To Our Customers and Friends:

In these times of stress when it seems impossible to fill orders as quickly as you would sometimes wish, we want you all to know that every effort is being made to serve you to the best of our ability, and that every ounce of our strength is being exerted with that thought in view—namely, to serve—so that you may always have on hand sufficient of the wires that are noted for their long runs, and which always make good our claim that

"Appleton Wires are Good Wires"

APPLETON WIRE WORKS
Appleton, Wis.

On July 1st last, England held in stock 1,000,000,000 pounds of raw wool, a supply equal to two years' consumption in the United States. On September 1st, Australia held 459,000,000 pounds unsold. Then in October the New South African and South American clips were thrown onto a groggy world's market. In November this year's Australian and New Zealand clips were ready for sale, and last, but not least, 75 per cent of our own this year's domestic clip is held on consignment in the eastern part of the United States unsold. Without doubt there is at present a three years' raw wool stock available in the world's market. You can buy it at your own price.

But what has this wool situation to do with the wood-pulp paper situation? Nothing.

Is there an analogy between the two situations? There is not.

There was during the war an enormous, almost insatiable, demand for wood. Wood for barracks, buildings, bungalows, aeroplanes and pulp. Lumber was exported in immense quantities. Our already depleted forests were further exhausted. More wood papers and pulp were consumed for newspapers, magazines, towelings, bandages, cups, ropes, plates, carpets, rugs, shipping containers, coverings and wrappings, than ever before in our history, and the consumption is on the increase.

July first, 1920, saw the bottoms of the wood piles at the wood-pulp mills. October first saw the clean-up of reserve stocks of ground wood-pulps, and December finds the mills closing down for want of raw material and orders. With consumption continuing and production declining, what's the answer?

Now there is one important factor which the average buyer of wood papers overlooks in these times, and that is the supply factor which has a most important influence upon the market movement of any commodity. The law that governs markets is the law of SUPPLY and demand. Most buyers are now over-emphasizing the importance of the demand factor and ignoring the supply function of the law. It is only stupidity and lack of correct information which causes buyers to conclude that because wool prices have declined, suddenly and drastically, that wood paper prices will do likewise. Wood paper prices have not followed the market course of wool prices, and they will not, for the reason we have tried briefly to outline above; namely, that there are enormous stocks of raw wool available and pressing on the markets daily, but there are no reserve stocks of spruce wood, wood pulps, or wood papers, anywhere in the world and no pressure of such on the market. Woolens are weak and wood papers are strong in price, and so they will remain until the fundamental supply conditions change, and all the "bunk" talk, superficial comparisons or desires to buy wood papers on wool condition basis, will avail nothing.

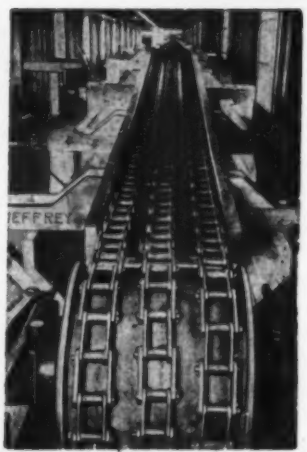
And finally, Mr. Printer and all other buyers of wood pulp paper should bear clearly in mind that the source of raw materials in the paper business are the forests of spruce wood in America. It takes thirty to fifty years to grow a good pulp producing tree; it only takes one year to raise a wool-producing sheep. The over-production or underproduction of raw wool can be readily regulated. Sell off the sheep for a year or two and woolens will appreciate, then when the price becomes high and profitable the growers will augment the supply greatly in twelve months, and the same thing applies generally to cottons, sugar, flour, and raw material supplies for most every other commodity.

The wood pulp and paper business is the exception. Paper buyers and consumers in the United States have not as yet awakened to the serious depletion of the raw material supply of the industry. With a constantly increasing consumption of cellulose producing trees, an absence of any re-forestation replenishment for future supply, and no other substitute available for raw material until prices of paper approximate and justify the use of raw cotton instead of wood pulp, large consumers of paper and buyers thereof will do well to avoid the short side of the paper market.

This illustration shows how a large yard storage space can be utilized by the installation of a Jeffrey Cable Conveyer in conjunction with a Jeffrey Portable Stacker.

The Jeffrey Log Stacker, shown at the right of illustration, elevates to a height of approximately 50 feet.

Another unit of the complete Jeffrey Conveying System at the P. H. Glatfelter Company, Spring Grove, Pa., showing **Wire Cable Conveyer** which brings the logs to the mill.



A Series of Plain Chains; for carrying logs direct to stackers, or diverting to Barkers through openings in side of trough.

The Jeffrey Pivoted Bucket Elevator-Conveyer for handling coal and ashes in power plants.

The Jeffrey Single Roll Crusher reduces lump or run-of-mine coal to stoker sizes in a single operation.

Handle it Mechanically

WITH

Jeffrey Conveyers

THESE illustrations, showing only a few of many phases of handling Logs, Pulp Wood, Pulp Laps, Straw, Bark, Coal and Ashes, and other materials, that have been solved successfully by Jeffrey Conveyers, are typical of Jeffrey Efficiency and Economy.

Jeffrey Equipment for Paper and Pulp Mills, also includes Shredders, Crushers, Pulverizers, Screens, Electric Trolley and Storage Battery Industrial Locomotives, etc.

Write for Our Latest Catalogs

The JEFFREY MFG. Company

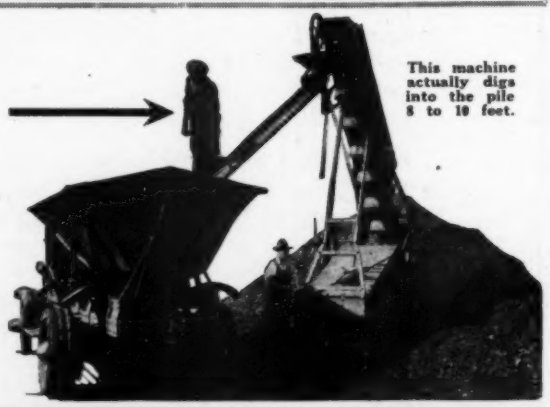
813 North Fourth Street COLUMBUS, OHIO

New York	Cleveland	Philadelphia	St. Louis	Denver
Boston	Scranton	Pittsburgh	Milwaukee	Montreal
Detroit	Los Angeles	Buffalo	Birmingham	Charleston, W. Va.
		Chicago	Dallas	

Jeffrey Radial Loader

Jeffrey Radial Loader handling coal from ground storage. This type of loader is built in two sizes; Type "G" loads 1½ to 2 cubic yards of Coal, Ashes, Sand, Gravel, Crushed Stone and other loose materials per minute. Type "K" cubic yard per minute.

Send for Catalogs No. 288-Y *and* 309-X.



This machine actually digs into the pile 8 to 10 feet.

PITTSBURGH PIPING

Service Plus Satisfaction

are incorporated into every Pittsburgh Piping installation. Pipe Bends used in place of elbows, provide for expansion and contraction, reduce friction and minimize loss of pressure.

Our machine shop, bending, forging and welding departments and our iron and steel foundries are equipped with the most modern tools and appliances.

Specify "Pittsburgh Piping" and you mention the best there is in Power Plant Piping construction.

"WHEN YOU THINK OF PIPING THINK OF PITTSBURGH PIPING"

PITTSBURGH PIPING & EQUIPMENT CO.

MANUFACTURERS & CONTRACTORS

PITTSBURGH, PA.

NEW YORK 220 BROADWAY

CHICAGO PEOPLES GAS BLDG.

SAN FRANCISCO MONADNOCK BLDG.

CLEVELAND AMERICAN TRUST BLDG.

INDIANAPOLIS TRACTION TERMINAL BLDG.

BIRMINGHAM AMERICAN TRUST BLDG.

PITTSBURGH PIPING

XYLITE

The Paper Mill

LUBRICANT

For DRYERS, BEATERS,
GRINDERS, SCREENS,
GEARS, ETC.

Xylite Felt Cleaner for Felts

Xylite Belt Dressing for Belts

G. B. STOCK
Port Huron

XYLITE

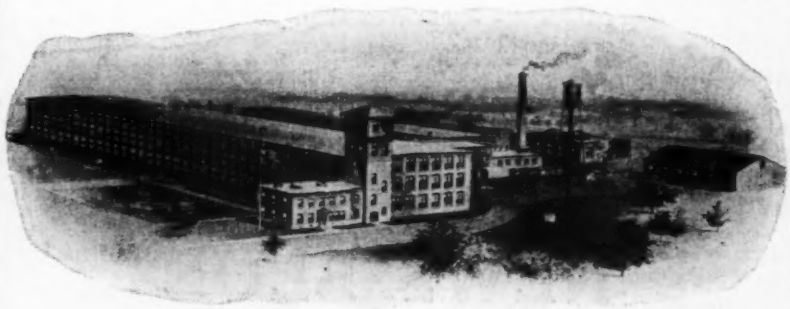
Grease & Oil Co.
Michigan

"ALBANY" Felts *and* Jackets *for* Paper & Pulp Mills

ALBANY FELTS are adapted for every type of Paper and Pulp Machine, and for every kind of stock. Every one is made of Pure Wool of the very best quality.

¶ Twenty-five years' experience in making Paper Makers Felts and Jackets has shown us how to make them as best suited to the needs of various kinds of machines and stock.

¶ Every possible effort is made to give our customers the best satisfaction and to weave into our Felts and Jackets the longest possible life.



ALBANY FELT CO.
ALBANY — NEW YORK

GEIGY COMPANY, Inc.

89 Barclay Street NEW YORK CITY

ANILINE COLORS

Selling Agents for J. R. Geigy S. A., Basle, Switzerland
Established 1764

Selling Agents for CINCINNATI CHEMICAL WORKS, Inc., Norwood, Ohio
(Successors to The Ault & Wiborg Company—Dye Works)

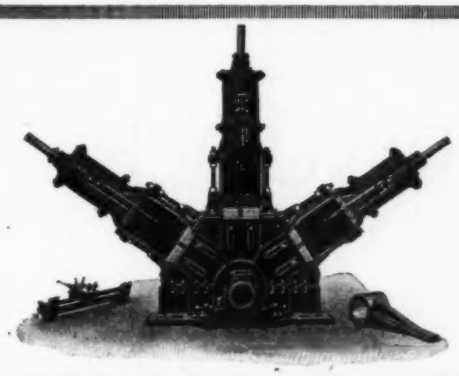
BASIC	ACID	DIRECT
Fuchsine Crystals	Scarlet 2 R	Chicago Red
Fuchsine Powder	Scarlet 2 R B	Chicago Red 3 B
Malachite Green H. P. Crystals	Croceine Scarlet 3 B X	Sun Orange R
Methylene Blue D Pure	Acid Bordeaux	Direct Yellow 2 G
Setoglaucine (Patent Blue Shade)	Croceine Orange N L	Paper Yellow
Methyl Violet B S	Metanil Yellow	Diphenyl Green K G C
Methyl Violet 6 B	Helianthine G	
Methyl Violet R	Azo Yellow N R C	
Methyl Violet 5 R	Acid Green M	
	Erio Green Extra	
	Erioglaucine Supra	
	Acid Violet T P S Conc.	

NEWS BLUE

Write for Sample and Price

BRANCHES

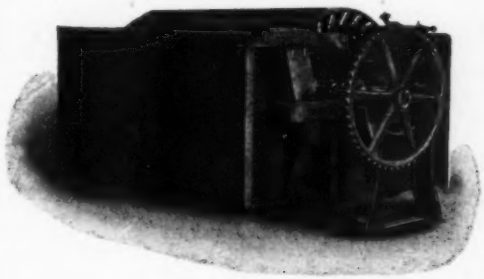
Boston Providence Philadelphia Toronto Chicago Columbus, Ga.



Standard Wood Pulp Grinder

Built in Three Sizes

Taking wood 24″, 30″ or 32″.
Bridge-trees—Are well proportioned.
Flanges—Made of steel, 40″ diameter.
Hydraulic Cylinders—Copper lined, 12″, 14″ or 16″ diameter.
Pillow Blocks—22″ length of bearing.
Pockets—Very heavy and designed particularly for free discharge of pulp.
Service—Continuous distinctive service is always assured.



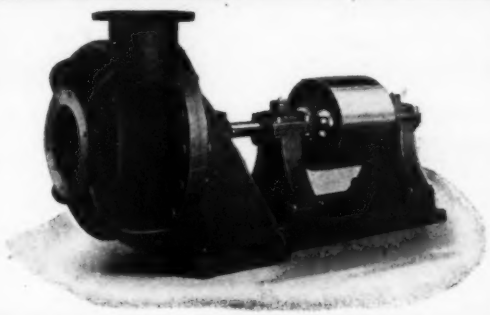
The Wood's Machine

Used as Pulp Thickeners, Savealls, Pulp Washers and Water Filters

ADVANTAGES:

Reduced Wire Costs	No Couch Roll
Enormous Capacity	Minimum Repairs
Only 2 H. P. Required	No Doctor
Works Automatically	Requires No Attention

TWENTY-THREE SOLD DURING THE PAST YEAR



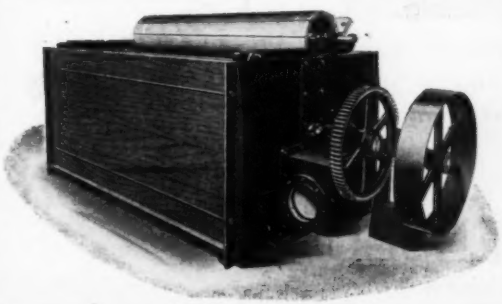
Heavy Duty Paper Mill Pumps

Built Especially for Handling Stock

Impeller—Extra wide, enclosed type and perfectly balanced against vibration and end thrust.

Suction Inlet—Is of large area, giving a free and easy entrance to same.

Our Pumps are economical in use, simple in construction, of very great durability and discharge continuous steady stream.



Improved Decker

Single or Double Cylinder Type

Built in the following sizes:
Cylinder mould diameter, 36″ or 40″.
Face of cylinder mould, 72″, 84″ or 96″.
Cylinder mould of best reinforced construction and properly supported with our latest design outside bearings.
Vat furnished either all wood or with cast iron ends.
For Stability and Efficiency our Improved Deckers are Unexcelled

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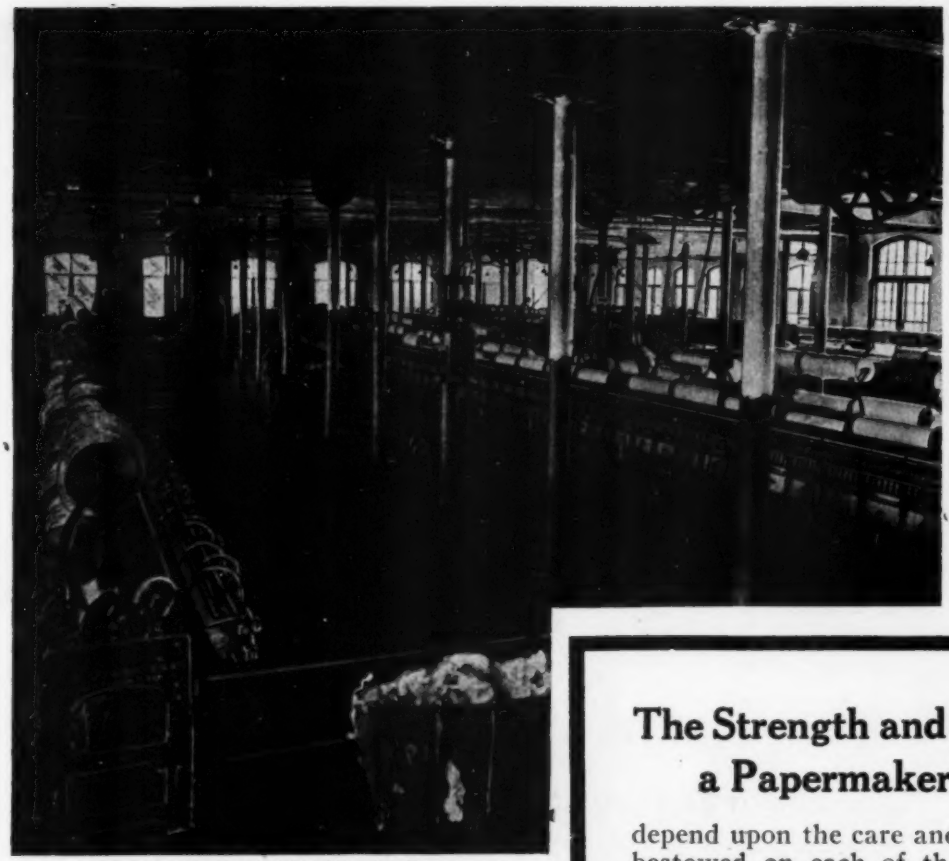

A corner of the Kenwood Mills Spinning Department

The Strength and Service of a Papermaker's Felt

depend upon the care and watchfulness bestowed on each of the innumerable construction processes. The soft wool strand of straightened fibers as delivered from the carding machine must be twisted or spun in order to form and give strength to the yarn or yarn thread. Grandmother spun a single strand. The machines which twist and fashion the yarn in the Kenwood Mills handle as many as 360 strands at one time. By means of these complicated machines, known as "Spinning Mules," Kenwood workmen are enabled to produce the quantity and quality of yarn necessary to serve the many Kenwood customers so satisfactorily.

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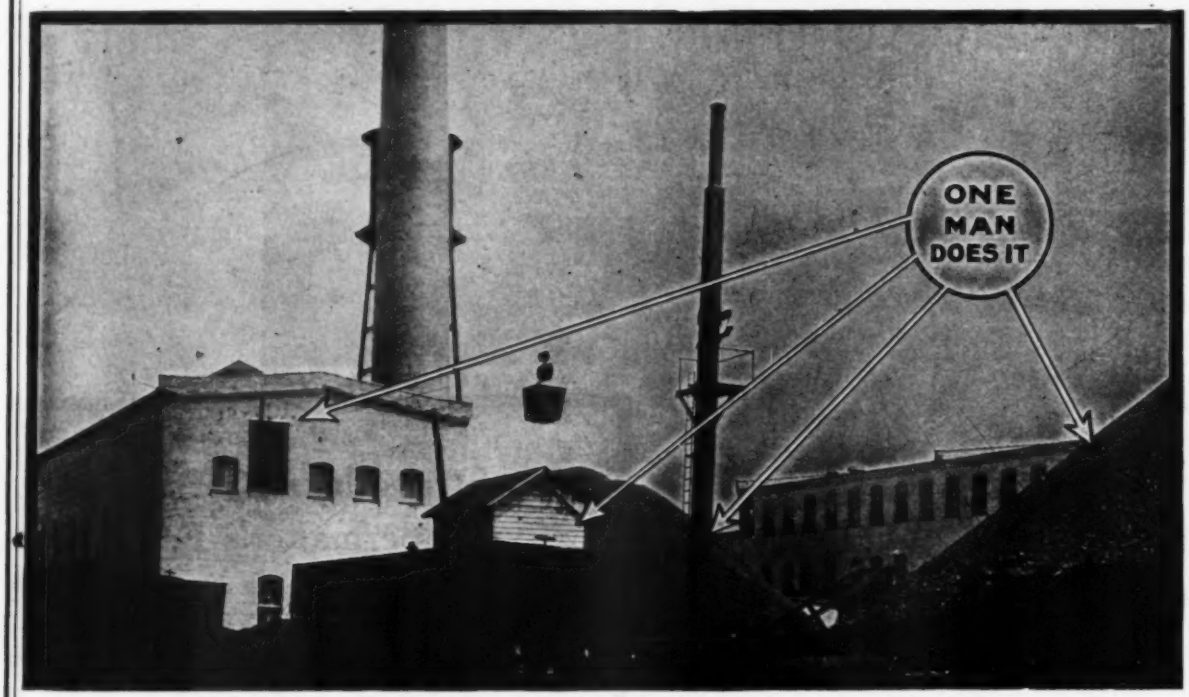

Typical Cableway Installation showing coal being carried in bucket direct to Boiler Room.

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THE PAPER INDUSTRY was started with the one idea of being helpful to the whole Pulp and Paper Manufacturing Industry. We believe we have succeeded. At least many people tell us so, but we want to do more in being helpful, so that every man in the industry may know more of his chosen work.

Many men in this industry have valuable ideas that would be worth hundreds, possibly thousands of dollars, for other men to know, and at the same time will not harm the one man that knows it. The old idea of hiding our light under a bushel for fear someone else will learn of something that we may know has passed, and the war was to a large degree responsible for this. It is stated that America advanced more in most of the arts and sciences, as well as manufacturing processes, in the few years of the war period, than it had in fifty years before.

We lose nothing by giving out knowledge. If each of two men have a dollar and each gives his to the other, both will have the same and gain nothing, but if each of two men have an idea, and each gives away that which he has, he does not lose, but each has two, and so if we multiply this by one hundred or a thousand, each man that formerly had only one idea, now has a hundred or thousand, and no one has lost.

So, in order that the greatest number may have the greatest amount of knowledge, and in order to get men to take the time for the proper study and preparation of the right kind of an article, we will give to those who will endeavor to furnish us with real helpful articles, during the next twelve months, the following amounts:

For the best article furnished in this competition, we will give the sum of $300.00.
For the second best article we will pay $100.00.
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For the fourth best article we will pay $25.00.
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For the next thirty-one best articles, we will pay $10.00.
For the next forty best articles we will pay $5.00.

Any one man may write as many articles as he desires, providing they are on different subjects. Each article, however, should fill at least three pages of THE PAPER INDUSTRY.

Several well known men of the industry will be chosen as judges in this competition, their names to be announced at a later date, and the publisher of THE PAPER INDUSTRY will only decide first whether the article is worthy of publishing at all, and if so, then it will take its chance for the $300.00 prize.

In order to make it possible to publish these papers during the next twelve months, papers must begin to come in immediately and the minimum price of $5.00 will be paid for each as they are published, the balance representing the prize money will be awarded after the twelve months period has expired, and the decisions have been made.

Some men feel that they know many good things, but cannot write them down in proper fashion. It will not be necessary that these articles be written to show any great amount of learning, as many men who have had little schooling may be able to furnish the most helpful ideas, and it is something that is helpful that we want; we have an editor for the very purpose of carefully scrutinizing everything before it goes to the printer, so that it may be grammatically and typographically correct.

You can choose your own subject, as there are so many things to be written about in this great industry that we will not even attempt to outline the full list of subjects, but it may be of some plan to get a larger product out of a machine; it may be on the subject of saving in the power plant; saving bleach, dye, or one of many other things; it may be a plan to make the wire or felt last longer; some method of making a better sheet without increasing the cost, or making as good a sheet by reducing the cost; a new idea in the process of pulp making; in fact it can be on any subject that will be helpful to pulp and paper manufacturers, and their employes.

Anyone can try his hand, be he president, manager, superintendent, chemist, engineer, machinery man, foreman, or workman. If some one should feel they cannot write a long article, then write a short one. We will pay for it, if we can use it.

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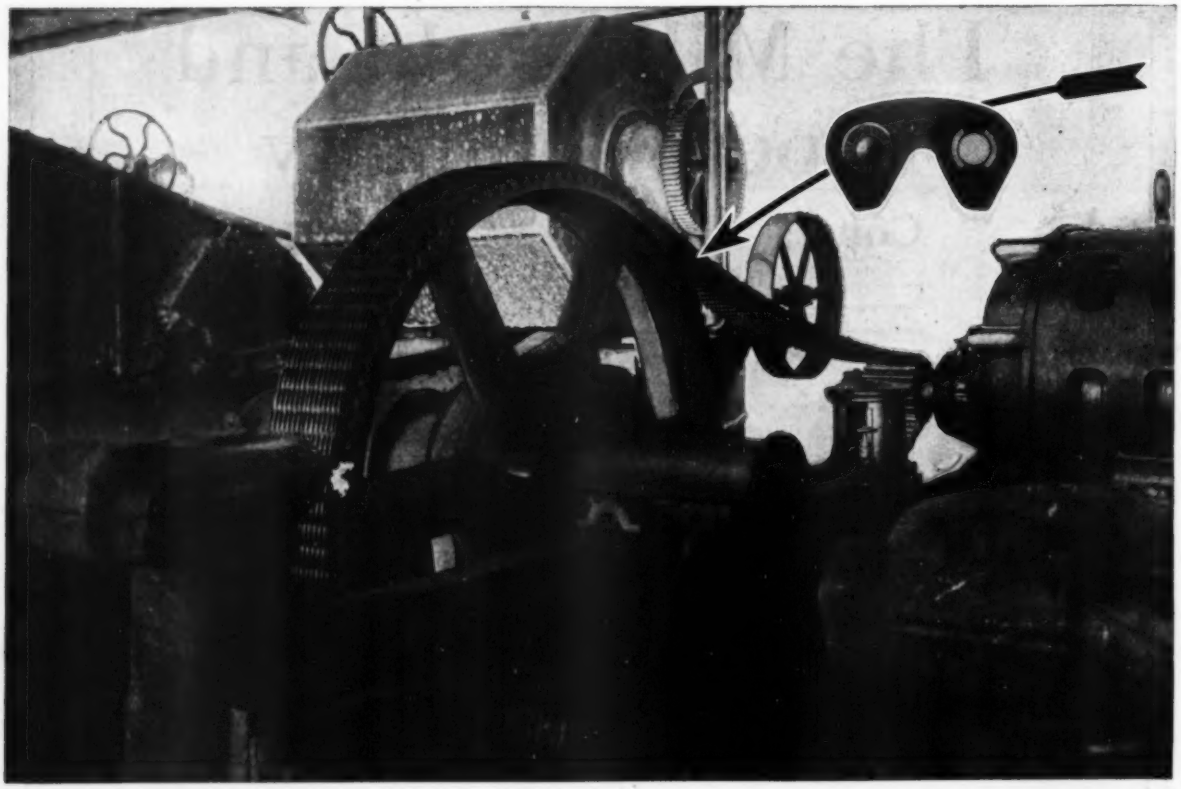

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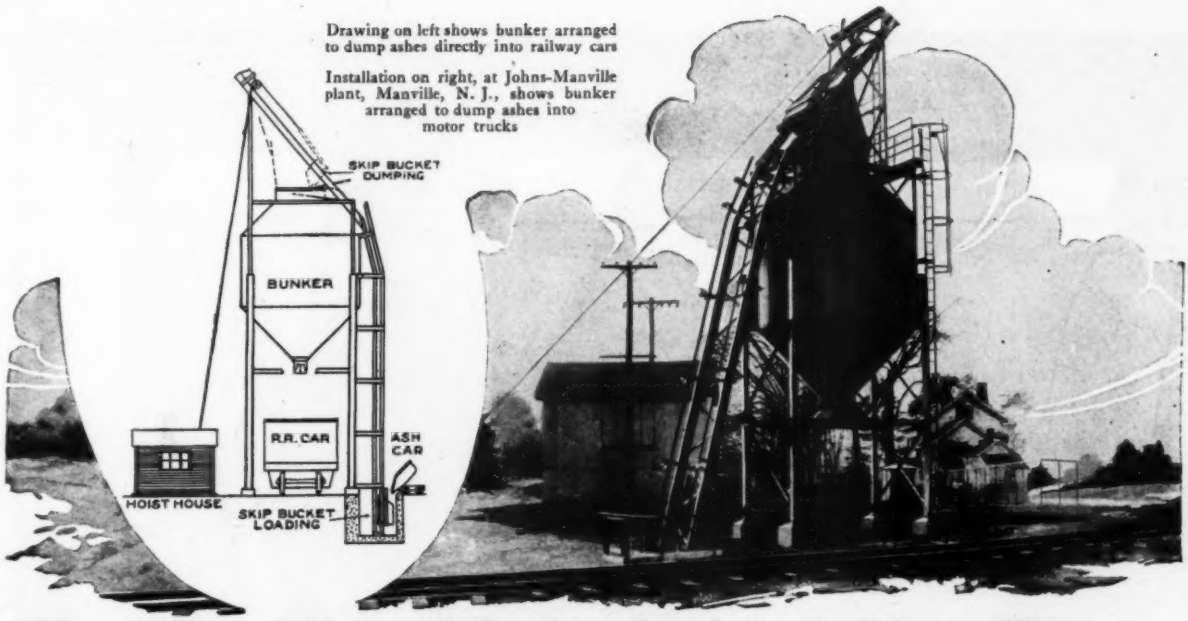
SILENT CHAIN DRIVES

Drawing on left shows bunker arranged to dump ashes directly into railway cars

Installation on right, at Johns-Manville plant, Manville, N. J., shows bunker arranged to dump ashes into motor trucks



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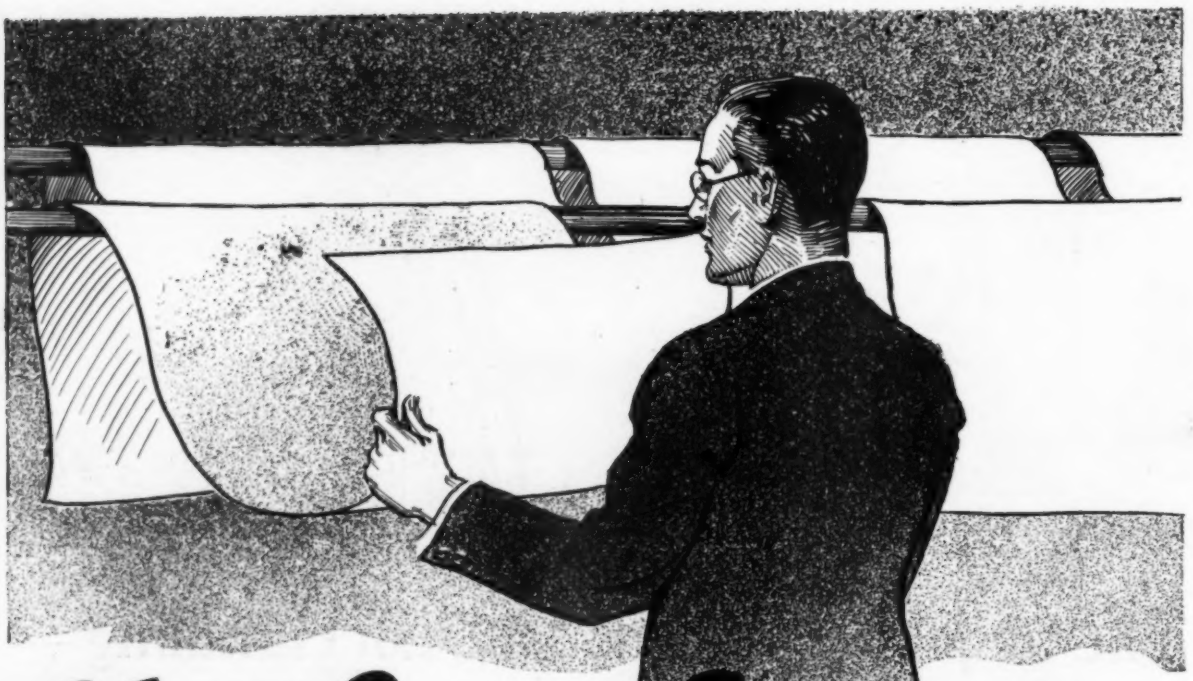

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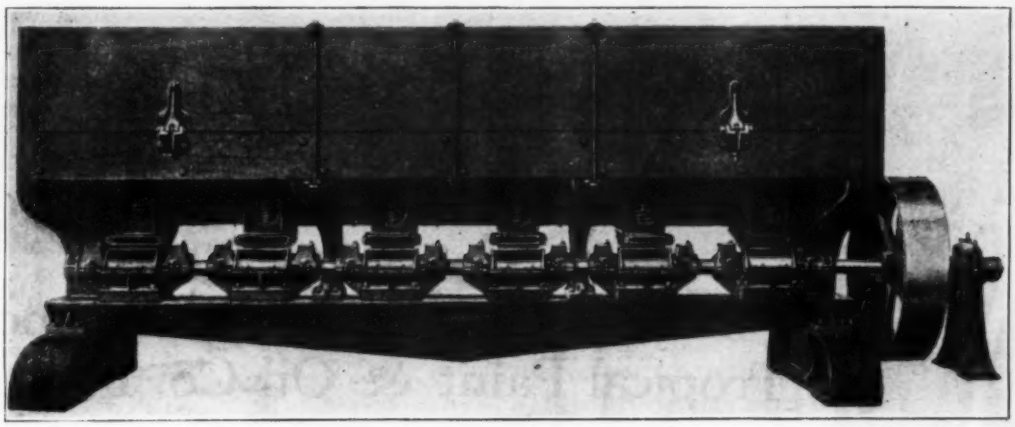
Pulp and Paper Mill Machinery



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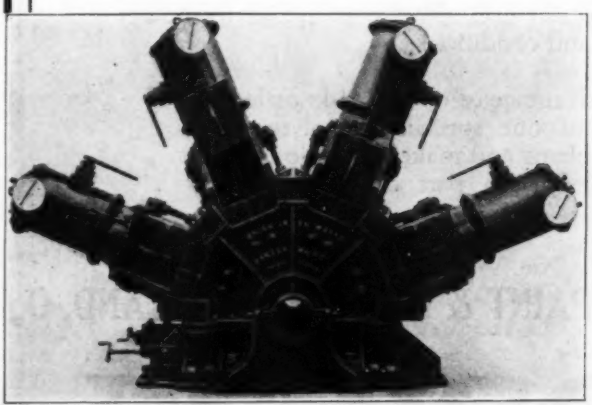

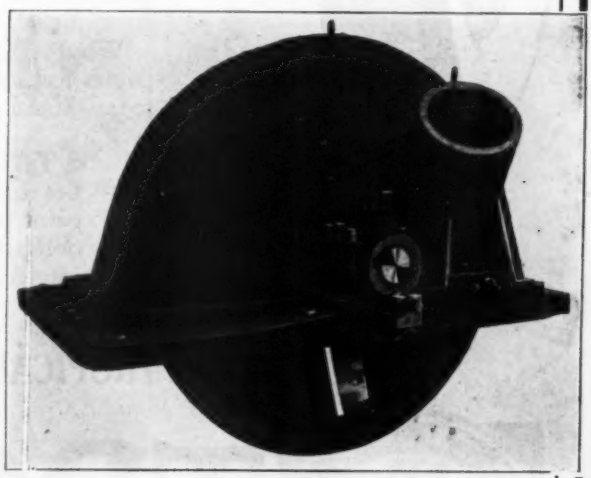

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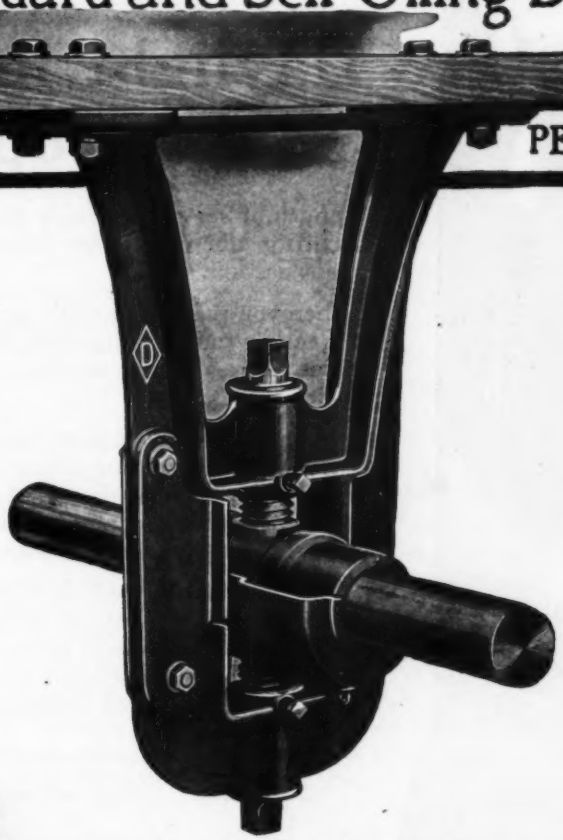

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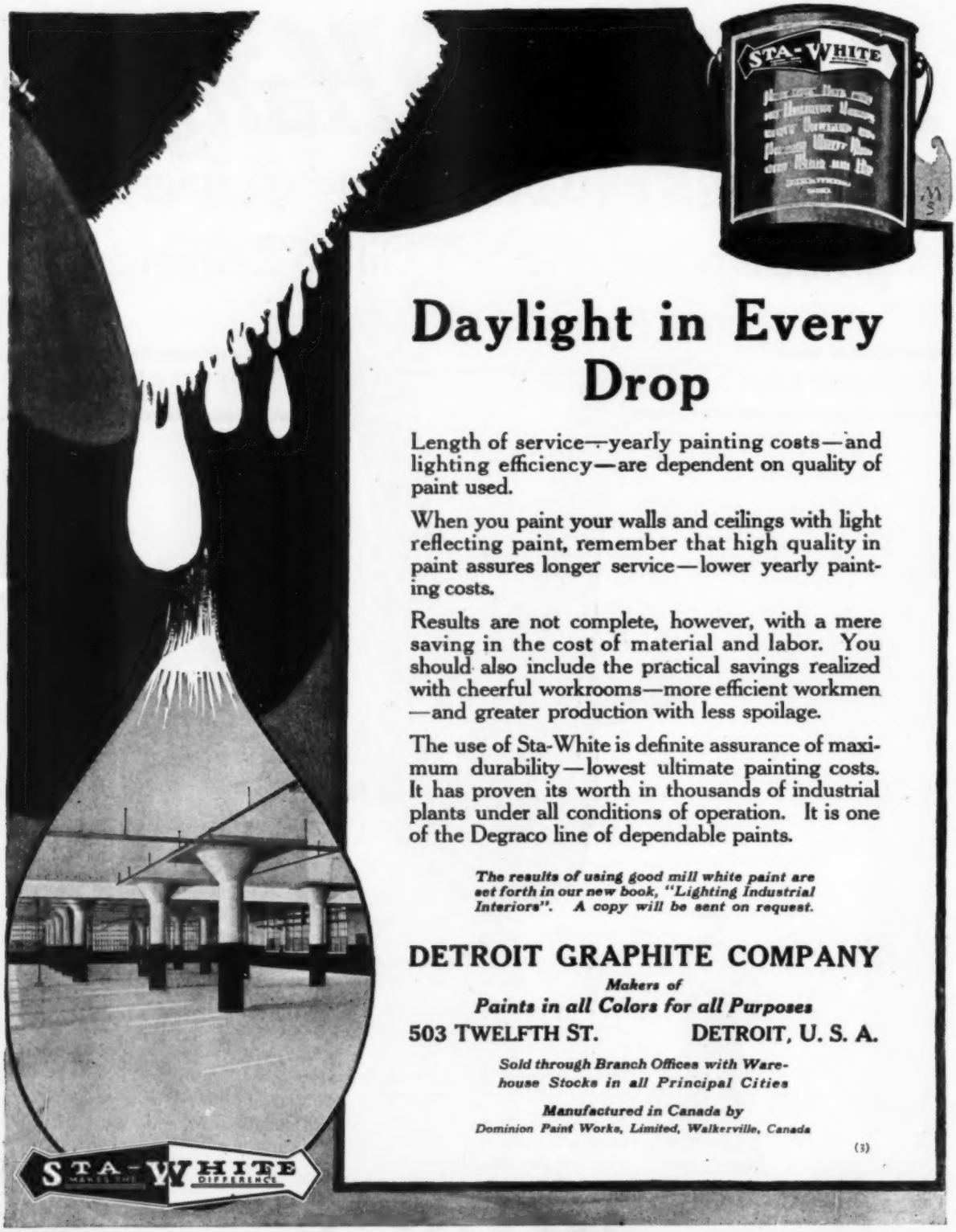

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DEGRACO PAINTS

All Colors for All Purposes

Power Plant Management

Coal and Ash Handling Equipment—Part I

By ROBERT JUNE, M. E.

This article is the first part of a series of four by Mr. June on the important subject of Coal and Ash Handling Equipment. The others will be published in succeeding issues.—Editor.

"WHAT DO YOU CONSIDER the most important advantage of your mechanical coal handling equipment?" I asked the superintendent of a large manufacturing plant the other day.

His answer, given without a moment's hesitation, was, "Elimination of the large and uncertain labor element. We have twenty 500 h. p. boilers, and at two seasons of the year we require every pound of steam we can get from those boilers, day and night, for weeks at a time. Before we put in our automatic coal handling system, we were at the mercy of our coal handlers and passers.

"Time and again the operations of our entire plant were embarrassed and the work in some departments even brought to a dead stop by the lack of a full boiler-room crew. We always paid good wages, but the physical conditions under which the men had to work were not good, and on a number of occasions I have been called up at my home late at night, and had to dress and start out in my car on a search for laborers. This was no joke at any time, but when it happened on a cold, rainy night, or with a blizzard for accompaniment, you can imagine the difficulties in getting men to leave their warm beds for any money or other considerations I might offer. On more than one occasion when I arrived at the plant with my hastily gathered crew, they took one good look at our coal piles, drowned in rivers of rain and sleet, or else frozen solid with a forty-mile gale frisking about them, and the thermometer down around zero, and refused point-blank to touch a tool.

"Automatic coal handling has changed all that. Because of its assurance of continuity of operation, the mechanical system we now have is worth several times what it cost us. We would employ it if it cost us twice as much per ton delivered to the boilers as hand labor."

Principle of System Is Right

That is one point of view. Another man, manager of a good-sized plant, said: "We installed mechanical coal handling because we were able to lay out a system which gave us three times as much storage capacity as we formerly had, and we felt it essential to insure an adequate supply of coal at all times."

A third point of view, typical of many, was expressed by a large operator. "We wanted to reduce handling costs as much as possible, and therefore substituted mechanical means for manual handling. Need I tell you that the savings effected have been very large, particularly during the past two years?"

As a rule, one good reason is all a man wants as explanation for an action; hence the failure of the gentlemen quoted to mention the advantages which appealed to the others. Upon further questioning, however, each mentioned the additional points as supplementary benefits which they enjoyed.

There does not seem to be any doubt that nineteen plant managers out of twenty, who have installed mechanical handling are thoroughly satisfied that they have made a move in the right direction. Some of them, it is true, would make radical changes in their equipment and lay out if they had the work to do over. The point is that they would do it over. Dissatisfaction, where it exists, is with the application of the system, not the principle.

As Reginald Trautschold sums up the situation: "The coal scarcity has made an adequate reserve of the utmost importance to every manufacturer, and its high cost necessitates that the fuel be handled at the plant as economically as possible. This condition has tended to make more general the mechanical handling of coal, for no plant, large or small, can now afford to pay the price of manual handling. The attention thus focused on the question of coal handling has resulted in radical changes in the methods employed to store coal and feed it to the furnaces. So effective have been these changes that it would be little, if any, exaggeration to claim that today a boiler plant for a large manufacturing power plant could be erected and furnished with adequate coal storage facilities, and equipped with a complete system of conveying mechanisms for handling coal from the point of receipt at the yards to the furnace grates, for less money than the most efficient layout of antebellum days. This, in spite of the high cost of equipment, material and labor."

Seek Counsel of Expert on Conveyors

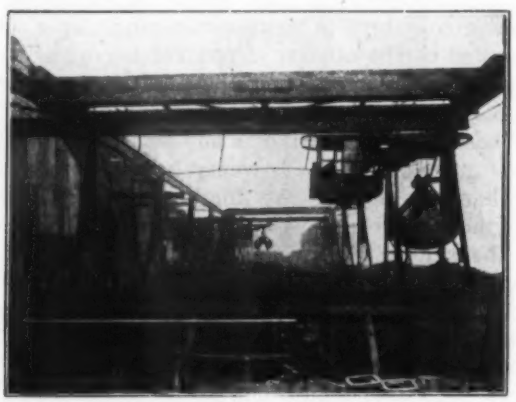
Having made out such a strong case in favor of the general handling of coal and ashes by mechanical means, a word of caution is here necessary; when you come to consider the proposition as applied to your own plant, get the advice of a consulting engineer or engineering firm, specializing in power plant design.

I do not mean to belittle the advice and suggestions of your own works' construction engineer, or of the

engineering department of the various conveyor manufacturers, or of the engineers and architects who handle your general building construction. These men are all apt to have mighty good ideas, and they should by all means be consulted. But, as they are all general practitioners, whereas you need a specialist, the law of averages is decidedly against your getting as good results from their plans as from those of a man who makes power plant design his chief business.

Various Methods Employed

The delivery of coal to the furnaces and the removal of ash are usually large items of expense. The



Two Shepard Transfer Cranes Equipped with Grab Bucket Hoist Over Coal Storage Pile. Coal is Received at End of Runway Shown in Background in Barges and Transferred to Storage. Installation Bridgeport Brass Co.

best method of handling coal and ash in any given plant is that which will do the work at the lowest final cost. I use the term "final cost" because insurance of continuity of operations and adequate coal storage are factors which do not appear in a cost-per-ton comparison of methods, but which may have considerable bearing on what may be termed the "earning power" of the power plant. (That is, it may be cheaper in the end to install a particular type of handling system which will cost more per ton to operate, but will insure avoidance of monetary losses caused by shut-downs due to lack of coal or to labor difficulties.)

That the problem of proper selection of methods is not easy is indicated by the almost numberless combinations of means and devices to be found in American plants. The principal factors which influence the choice of systems are size and location of plant and cost of fuel and labor.

The various systems in use may be tabulated as follows:

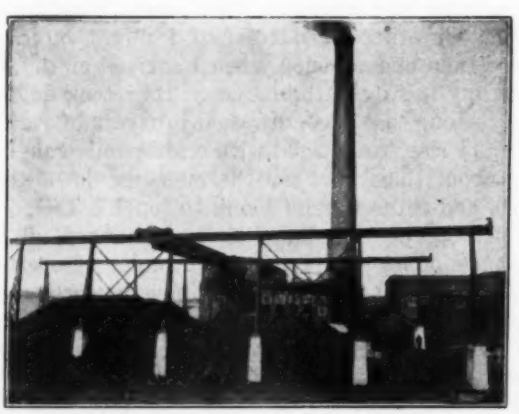
1. Hand shoveling, without or with wheelbarrow or car.
2. Conveyors—
   - (a) Screw or spiral.
   - (b) Flight or scraper.
   - (c) Apron and buckets.
   - (d) Overlapping dump buckets.
   - (e) Continuous belt.
3. Hoists—
   - (a) Hoist and hand car.
   - (b) Hoist and automatic cable car.
   - (c) Hoist and trolley; telpherage.
4. Cranes—
   - (a) Railroad with clam-shell bucket.
   - (b) Transfer with clam-shell bucket.
5. Vacuum system.
6. Combinations of above. (So-called "silo system," etc.)

Hand Shoveling

What are the practical limits of economical hand shoveling? No general answer can be given to this question. Its solution depends upon the individual circumstances. It is not necessarily a factor of the number of boilers to be served—for instance, the Burroughs Adding Machine Co., Detroit, Mich., finds it economical to employ mechanical coal handling for three boilers, whereas the Mulkey Salt Co., of the same city, serves eight boilers in a thoroughly efficient manner by hand work. The consideration governing the choice of means in each of these cases was point and manner of delivery, and this is the principal factor to consider.

If coal can be dumped from cars or dealers' delivery wagons into bins or on platforms directly in front of the boilers, it is certain that no cheaper means can be devised for hand-fired furnaces. In such instances, one man may handle the coal and ashes and attend to the water level of 200 h. p. With hand-shaking and dumping grates, one man may take care of 300 h. p.

In cases where coal cannot be stored in front of



View of Installation at Plant of American Thread Co. Shepard Transfer Crane Equipped with Grab Bucket Hoist Which is About to Enter Power House. This Plan Provided for Future Extension, as Will Be Noted from the Photo.

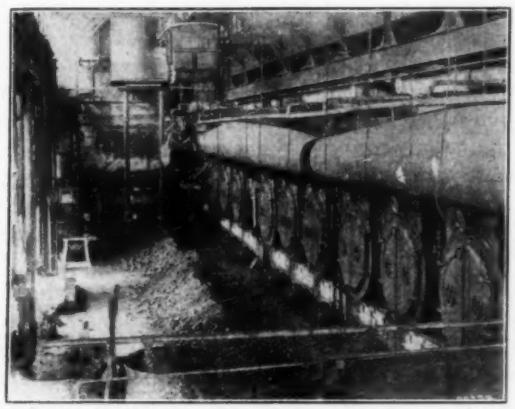
the boilers, but must be handled by wheelbarrow, cart or hand lorry, the practical economic limit of haul is usually 100 feet, and the economic quality limit 20

tons per day. While this is generally true, it is not a hard and fast rule. Thus Professor Gebhart states:

Gives Coal Handling Costs

"Hand-fired furnaces and manual handling of coal and ashes are usually associated with small plants of 500 h. p. and under, but a number of large stations are operated in this way with apparent economy. A notable example is the steam power plant of the Wood Worst Mill, Lawrence, Mass., in which 40 return tubular boilers are fired by hand. A tipcart with a capacity of one ton brings the coal a distance of 100 to 200 feet to the firing floor, and firemen shovel it on to the grate. Four men are stationed at the coal pile. One man drives two carts (one of which is being filled while the other is going with its load), sixteen firemen attend to the furnaces, and two men dispose of the ashes."

A good man is capable of shoveling 40 to 50 tons of coal in eight hours when unloading a car, provided it is only necessary to shovel the coal overboard. An



Grab Bucket Hoist Shown Inside Power House and Place Where Coal is Discharged for Firing Boilers. American Thread Co., Installation.

average figure for handling coal by barrow and shovel is not far from 2.5 to 3 cents per ton per yard, up to five yards. Above five yards, about 0.2 cents per ton should be added for each additional yard.

Obviously, the first step in any consideration of the installation of mechanical coal handling in a manually served plant is an accurate knowledge of the methods, results, and costs of the hand work which may be displaced. Study your conditions and costs thoroughly. Perhaps you can make comparatively inexpensive changes in your plant which will so improve matters that a mechanical installation will seem inadvisable. If no improvements in methods in use which can be suggested appear to meet the situation adequately, the time for an intensive study of mechanical systems is at hand.

Three Types of Conveyors

Conveyors are classified as "tractors" or "pushers," depending upon whether they pull or push the load. A third class are genuine "carriers" since the moving parts bear the weight of the load. Of these general classes, the "carriers" are usually more economical of operation and maintenance. Before deciding, however, let us examine the characteristics of the various types.

Screw Conveyors: These are of the "pusher" type, the apparatus consisting of a hollow shaft attached to which is a continuous spiral of sheet metal. The shaft is revolved by means of a motor in a trough of slightly larger diameter than the spiral, with the result that as the operation proceeds, material placed in the trough is worked forward.

Screw conveyors may be used up to 100 feet, and in sections of limited length up to an angle of 15 degrees. Speeds, capacities, and horsepower requirements for horizontal runs are approximately as follows:

Dia. screw in inches	Highest R. P. M.	Capacity tons fine coal per hour	H. P. required for each 10 ft. of length (coal)	Capacity cu. ft. ashes per hour	H. P. required for each 10 ft. of length (ashes)
6	115	6	.5	125	.5
7	110	8	.6	175	.5
8	105	14	1.0	350	.5
9	100	17	1.2	425	.6
10	95	22	1.6	375	.8
12	90	35	2.5	950	1.3
14	85	48	3.5	1,200	1.8
16	80	80	5.6	2,000	2.8
18	75	110	7.7	2,700	3.8

Advantages of this type are low first cast, adaptability and small space required for installation, but these may be offset by high cost of maintenance, due to rapid and excessive wear and tear, by losses caused by breakdowns at important periods and by the high cost of power to operate.

Not Much Difference in Flight Conveyors

Flight or Scraper Conveyors: These are of three types, plain, suspended flight, and roller flight. The trough is of any section, but is usually built with greater width than height. Flights which conform to the shape of the trough are attached to single or double strands of chains. Material is usually discharged through gates in the bottom of the trough.

The design of the plain scraper provides for the suspension of the flights from the chains, which drags them along the trough, pushing the load ahead. Cross-bars, having wearing shoes at each end, are provided with the suspended flight conveyors. The arrangement is such that the flights do not touch the trough at any time. Differing slightly from the suspended type, the roller flight substitutes rollers for the wearing shoes.

As between the three types of flight conveyors, service and maintenance considered, there is not a great deal to choose. The general layout of the plant will usually suggest the type to be employed. In this connection we will illustrate one or two typical

installations of flight and scraper conveyors in the continuation of this article next month.

The power required to operate flight conveyors may be closely approximated by the following empirical equation:

$$\text{H. P.} = \frac{\text{AWLS}}{1{,}000} \text{ plus } \frac{\text{BLT}}{1{,}000} \text{ plus } x$$

in which

H. P. = the horsepower required at the conveyor drive shaft.

A. B. = constants as in table to be given in succeeding issue.

W. = weight of conveyor per foot of run, pounds.

L. = distance (in feet) between centers of head and tail sprockets.

S. = speed of conveyor, feet per minute.

T. = capacity of conveyor, tons (2,000 lbs.) per hr.

x. = 1 for conveyors up to 100 ft. centers and 2 for longer conveyors.

If the conveyor is composed of portions on different inclines, compute the power for each section separately and add 10 per cent for each change in direction.

As a general proposition, flight conveyors are low and offer an economical and efficient means of handling coal and ashes in small plants.

Next month we will discuss other types of conveying apparatus.

Manufacturers and Transportation

By SAMUEL M. FELTON

President, Chicago Great Western Railroad

Address Before the Fall Business Conference of the American Paper and Pulp Association, November 11, 1920, at the Congress Hotel, Chicago

I DOUBT if most of you have fully considered to what extent the future of your industry, and every other industry in the country, will be influenced by the way the railway problem is dealt with. It is natural for persons who are intensely engaged in the management and development of concerns of a particular class to proceed on the assumption that they need not especially concern themselves about the problems of other industries. I wish to emphasize the point that unless you and other business men help to solve the railway problem in the right way, you will imperil all you have embarked in your own business.

Two great economic principles are struggling for mastery today in every civilized country. One is the principle of private ownership and management of property, the other the principle of socialistic ownership and management. Some advocates of the socialistic principle favor both the acquisition and the management of all property by the government. Others advocate its acquisition by the government and its management on the Soviet plan by the employes. They agree, however, in contending that private ownership and management of property should be abolished. The true radicals do not confine their application of the socialistic theory to railroads and the public utilities. They apply it to all property. When the workmen of Italy arose recently and tried to start a Bolshevist revolution, one of the first plants they seized and began operating was the Fiat Automobile plant. They did not make any fine distinction, as some of our quasi-socialists in this country do, between concerns engaged in so-called public service and those engaged in an entirely private business.

No student of the radical propaganda being carried on can reasonably doubt that if it should result in the adoption of either permanent government management of the railroads or their management by the employes under some such scheme as the Plumb plan, this would be followed by the application of the same general principle to other industries. There is already much agitation for the nationalization of the coal mines. If the railways and coal mines should pass into the ownership of the government, how long do you think it would be before other such concerns as the steel mills and the paper mills would go?

For many years we had much theoretical discussion of the relative advantages of private management and government management of the railroads. Within the last four years we have made in the United States some actual tests of the relative efficiency and comparative advantages of private and government management of railroads which are among the most significant and important tests of the kind ever made. When the United States entered the Great War, our railroads were under private management. Co-operation between them was narrowly restricted by our anti-trust and other regulatory laws. Their managers, nevertheless, made a great effort to so co-ordinate them and increase their efficiency as to enable them to perform their part in carrying on the war, but at the end of 1917 the government seized them and assumed their operation. After twenty-six months they were returned to private management.

Railroads Under Public and Private Ownership Compared

There recently has been much discussion of

whether under government control the railways were operated more efficiently than before government control was adopted and since it was terminated. A former Director-General of Railroads in a recent address has sought to show that under unified government control great increases in efficiency were made, and that since it was terminated these have been lost. He has voiced criticism because a large deficit was incurred by the railways in the first six months after they were returned to private operation. He has also criticised the advances in freight and passenger rates the Interstate Commerce Commission recently granted on the ground that they impose a burden on the consuming public, and has implied that this burden would not have been imposed under government operation. It is certain the public would have carried this burden in taxes if not in rates.

I have no desire to engage in controversy with the critics of private operation, but these criticisms raise the question of the relative advantages of government and private operation in a way that cannot be ignored. I intend, therefore, briefly to review and compare the records actually made under government and private operation.

The government had certain important advantages in operating the railways. It could and did disregard most of the laws which hampered the companies, such as the anti-trust law and the law giving the shipper authority to route his own freight. It set aside the numerous orders regarding the movement of freight which under private control had been issued by government departments. It could disregard the effects upon the earnings of individual railways of the diversion of large amounts of freight from its normal channels. It could reduce the amount of so-called non-essential freight offered for shipment, and did so by establishing an extensive system of embargoes and permits under which the shipper could ship only what the railways were ready to take.

The former Director-General claimed that under unified government control the freight carrying capacity of the railways was increased 15 per cent. The railways had more locomotives and cars when the government took them over than they ever had before, and yet the fact is that in 1918 under government operation the average amount of freight service rendered with each car actually was reduced. Even with the larger number of cars available the total freight service rendered was increased not 15 per cent, but less than two per cent. In the previous year the railways under private management had increased the amount of freight handled about nine per cent over the preceding year.

Soon after the armistice there was a heavy decline in freight business, but about midsummer, 1919, there was a great revival of industrial activity and of the freight traffic offered. From that time until very recently the volume of freight offered was so large that it taxed the resources of the railways to handle it. Last spring there was a series of "outlaw" switchmen's strikes which seriously interfered with transportation. One of the consequences was the accumulation of a vast amount of freight which had to be moved after the strikes were ended, and the development of a car shortage which on September 1st was about 146,000 cars. The former Director-General referred to this large car shortage as an evidence of the inefficiency of private operation. But the facts are that in both July and August, the two months immediately preceding the date on which this car shortage was reported, the freight service rendered was larger than in those two months of any previous year. In August the freight service rendered was larger than in any previous month of any year in history. It was equivalent to moving 42,700,000,000 tons of freight one mile, as compared with the previous high record of 40,000,000,000 ton miles. Complete statistics for September are not yet available, but those we have showing the number of cars of freight loaded indicate that there was a larger movement of business in September than in the same month of any previous year. Advance information received this morning shows the average number of cars moved per railroad per day the last of October, as 17,241 compared with 14,035 on July 1st. The percentage of cars on hand to move being reduced from 53.1 per cent in July to 38.8 per cent in October.

The railways had to render this record breaking service with a physical plant that had seriously deteriorated under government control. A large part of their cars were in bad order when they were returned to private operation, and 135,000 cars were in such condition that they have been scrapped since government control was terminated. The cars retired exceed, by approximately 100,000 the new cars acquired, which means that the railways have had to render this vast service with approximately that many less cars than the government was using a year ago. In the week ended October 22, however, the car shortage had been reduced to 65,965 cars, or about 80,000 cars less than on September first.

This greatly increased freight movement was secured by increasing the efficiency with which cars were used. The average number of miles that each freight car was moved daily was increased from 23.3 miles in February, the last month of government control, to 27.4 miles in August. This was equivalent to increasing the available supply of cars by 500,000. The number of tons carried in each loaded car was increased from 28.3 tons in February, to 29.8 tons in August. This was equivalent to further increasing the available supply of cars by about 112,000. The fact that with a reduced car supply the railways for four consecutive months have handled substantially more freight than was handled under government operation is sufficient answer to the contention that

their freight carrying facilities were more efficiently used under government than under private operation.

The Causes of the 1920 Deficit

Another ground upon which the former Director-General based his criticism of private operation was that in the six months from March 1st to September 1, 1920, the railways incurred a deficit of about $635,000,000. The government gauranteed to the companies during these months the same standard return as under government control, and a deficit was incurred because the operating expenses, taxes and guaranteed return of the companies exceeded their earnings. It is well known that under government control a large deficit was incurred, but it was implied by the former Director-General that the deficit under private operation was relatively larger than under government operation or than it would have been if government management had been continued. But why was a deficit incurred in the first six months of private control? Principally owing to the fact that under government operation the expenses of the railways constantly and rapidly increased and had reached their very maximum when the roads were returned. In August, 1919, under government management, railway operating expenses were $11,590,000 a day. Six months later, in February, the last month of government control, they were $14,310,000 a day, an increase since August of $2,720,000 a day. A simple calculation will show you that this increase in expenses was at the rate of $993,000,000 a year.

Chiefly because of this increase in operating expenses the deficit incurred under government operation rapidly increased. In August, 1919, the net operating income earned by the railways was $92,400,000. It declined from that time until in February, the last month of government control, the railways had an operating deficit of $12,200,000. That is, they earned that much less than no net operating income at all. In the first two months of this year, January and February, under government control, the railways earned only 1.84 per cent of the government guarantees. If government control had been continued, and they had continued to do that badly, the deficit in the six months from March 1 to September 1 would have been $458,000,000. In addition, in July the Railroad Wage Board granted an advance in wages of $52,000,000 a month. This was effective during the four months from May 1 to September 1, and therefore under government control would have added $208,000,000 to the deficit, which would have made the government's deficit at least $665,000,000. The switchmen's strikes also contributed largely to increasing the deficit incurred under private operation, and would have contributed equally to increasing it under government operation.

You will see, therefore, that the deficit incurred in the first six months of private operation was due to causes for which private operation was not responsible, and that the most of these causes were set in motion under government control. The deficit under private management would have been much larger had it not been for the increases in the efficiency of operation which were obtained and the economics which resulted.

After what I have said, I need hardly offer any explanation of the fact that it was necessary for the Interstate Commerce Commission just before the government guarantees were withdrawn to grant advances in rates amounting to $1,550,000,000 a year. If government control had been continued and they had made the advance in wages prescribed by the Labor Board and had not advanced the rates, their deficit would have been equal to the advance granted by the Interstate Commerce Commission to the railways, effective August twenty-sixth.

The record made before government control was adopted and since it was terminated compares so favorably with that made under government operation that it is difficult to conceive how anybody can study the two records without concluding that they demonstrate the superiority of private over government management. That the attacks upon private management will be discontinued, or that the advocacy of government management or management by the employes under the Plumb plan will cease, is not, however, reasonably to be expected. There are some classes of persons who believe that, whatever might be the effect upon the public, they themselves would profit by the destruction of private ownership and management. As long as they believe this the propaganda against private ownership and management will continue. As long as this propaganda continues it must, for the welfare of the public, be met and resisted. In order that private management may be made a permanent success, the railways must have the support of the business interests of the country in their efforts to operate the properties efficiently and to secure rates and net earnings which will enable them to provide the facilities essential to the rendering of good and adequate service.

We do not know yet whether the net returns which the railways will be able to earn under the rates recently fixed by the Interstate Commerce Commission will be adequate. The returns earned under these rates by most railways in September were disappointing, and the companies are now confronted with a declining tendency of traffic which may reduce both their total and their net earnings. Railway officers should use their utmost endeavors and all their ability to operate and develop the railways with the greatest efficiency, and they ought to be able to rely upon the business interests of the country to support them in whatever measures may be necessary to enable them to accomplish this purpose.

Furthermore, they ought to be able to rely upon the business interests to stand with them in resisting all efforts to destroy private ownership and

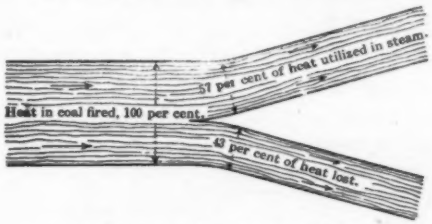
management and substitute for it either government management or some soviet plan of employes' management. The railways are the first outpost in our industrial system which advocates of a socialistic policy are trying to take, and, as I indicated in opening my remarks, success of the propaganda against private ownership and management of railroads probably would be only the beginning of the destruction of the private ownership and management of many of the industries of the country.

Saving Fuel by Controlling Chimney Losses

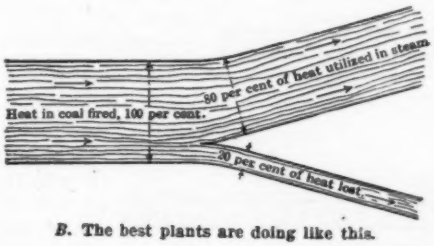
By F. F. UEHLING, Comb. Engr.

Paper Delivered Before the Fuel Section of the Sixth National Exposition of Chemical Industries, New York, September 21st, 1920.

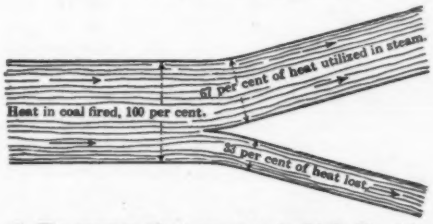
THE subject of fuel economy is today of greater interest to the fuel consumer than ever before. There are two reasons: First, fuel costs two or three times as much as it did a few years ago, and second, it has often been very difficult to get at any price during the past few years. The first reason is one that will remain. Prices of fuel, no matter what kind, will undoubtedly stay high, and in all probability will go still higher. The second reason, however, should vanish entirely when once labor and transportation facilities are properly controlled.



A. The average boiler plant does like this.



B. The best plants are doing like this.



C. The average plant can and should do like this.

FIGURE 1.—Diagrams showing possible improvement in efficiency at average boiler plants.

There is plenty of fuel for all who need it. The fuel given us by nature ready for use, will last for generations, but even when all our mines are exhausted and our oil fields pumped dry, there will still be enough fuel in one form or another. Mother Nature will at that time again come to our protection with that greatest of her laws, the conservation of matter and energy. Carbon and hydrocarbons are really conserved by her unseen hand, but it remains for man to turn the key which will unlock her great storeroom.

The high cost of fuel therefore provides the principal incentive to save it, and the greater the cost the greater will be that incentive. The principal factors which enter into the cost of fuel are labor and transportation. Its price to the consumer will be governed by these two charges, plus whatever additional charge competition will permit the mining interests to add. As our resources are depleted, mining will become more difficult and as production moves farther away from consumption, transportation charges are bound to increase. The price of fuel will therefore advance from year to year until finally it will be cheaper to make artificial fuel, such as alcohol. In all probability, however, the cheapest fuel for our principal needs will be that which can be gotten out of the ground, as long as it lasts, in its ready-to-use form. That is why it should be made to last as long as possible through the practice of economy. However, since the price of fuel in the future does not seem to interest the present generation, the elimination of unnecessary waste should perhaps even be enforced by law for the benefit of posterity.

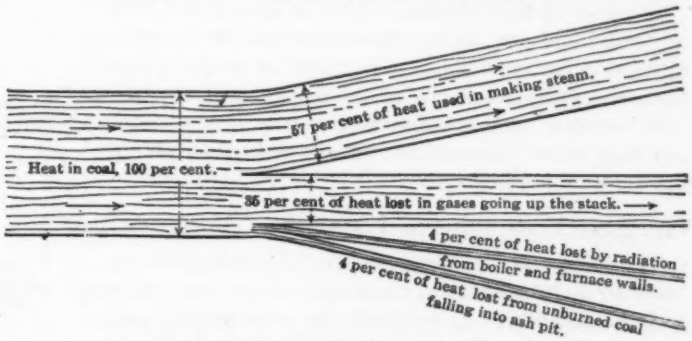

57 per cent of heat used in making steam.
Heat in coal, 100 per cent.
36 per cent of heat lost in gases going up the stack.
4 per cent of heat lost by radiation from boiler and furnace walls.
4 per cent of heat lost from unburned coal falling into ash pit.

FIGURE 2.—Where the heat goes in the average boiler plant

Over One-Third of the Fuel Is Lost Up the Chimney

No matter how the fuel we use is consumed and no matter what kind of fuel is burned, whether solid,

powdered, liquid or gaseous, the biggest loss is always due to the heat energy wasted up the chimney. In this connection it might be well to quote the following very conservative statement from Technical Paper No. 205, issued by the Bureau of Mines:

"In the average boiler plant, 35 percent of the heat

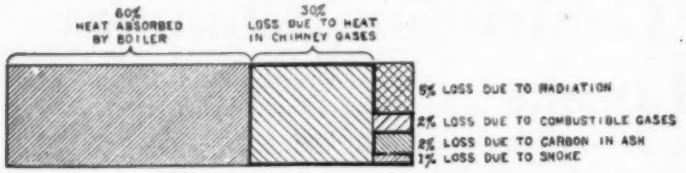

60%
HEAT ABSORBED BY BOILER
30%
LOSS DUE TO HEAT IN CHIMNEY GASES
5% LOSS DUE TO RADIATION
2% LOSS DUE TO COMBUSTIBLE GASES
2% LOSS DUE TO CARBON IN ASH
1% LOSS DUE TO SMOKE

Fig. 3. Chart showing what becomes of the total heat in the coal; 60 per cent. is absorbed by the boiler; while almost all of the 40 per cent. waste is due to the heat carried off up the chimney.

in the coal burned under the boilers is lost with the stack gases. That is, out of every 100 tons of coal burned under the boilers, the heat of 35 tons literally goes up the stack. It is this loss that can be greatly reduced and every effort should be made to do so."

Figures 1 and 2, which are reproduced from the same Government bulletin, illustrate graphically the magnitude of fuel waste in steam boiler practice and show that the most important part of it is due to the loss up the chimney. According to the speaker's experience, however, this loss in the average plant is not less than 40 per cent and in very many cases approaches 50 per cent of the total heat energy in the fuel used.

The loss up the chimney, which is always the largest individual loss in any plant, depends for its magnitude on three factors. They are, in order of importance, first, excess air in the products of combustion; second, temperature of the products of combustion; third, amount of unconsumed fuel in the products of combustion.

Greatest Loss Due to Using Too Much Air

The excess air in the products of combustion results in a loss greater than that from any other source. Each kind of fuel requires a definite amount of air to burn it, the exact quantity depending principally upon the ratio of its carbon and hydrogen. When considering coal, for example, the principle constituent is carbon, every pound of which requires twelve pounds of air to completely consume or oxidize it. All air that is used above this amount is known as excess air, and when supplied in greater quantities than is necessary to meet the particular conditions of the furnace in which the fuel is burned, an unnecessary burden is immediately placed on the temperature possibilities of the furnace and the amount of fuel consumed to accomplish a desired result increases in proportion.

Even in fairly good practice, about twenty-five tons of air is used to burn one ton of coal, and in the more poorly operated plants, this amount is often doubled. Twenty-five tons represents a lot of air. Under normal conditions, it occupies a space nearly 16,000 times as large as the coal which it consumes. If the amount of air generally used to burn one ton of coal were contained in a pipe with one square foot cross-sectional area, it would have to be long enough to extend nearly from New York to Baltimore. Stated in another way, if the floor of a room were covered with coal to a depth of one foot, the ceiling would have to be over three miles high in order for the room to contain as much air as is generally used to burn that quantity of fuel. The fact that so much air is consumed in burning coal is not realized by the fireman and the important relation which this huge mass bears to fuel economy is generally not given sufficient thought by his superiors. Although air costs nothing, and is available in unlimited quantities, when used to burn fuel in excess

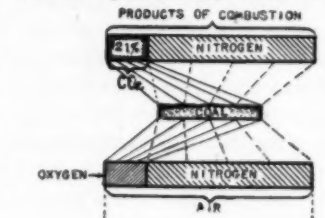


Fig. 4. Chart (a) showing how with the theoretical supply of air, the per cent. of CO_2 in the products of combustion is the same as the per cent. oxygen in the air.

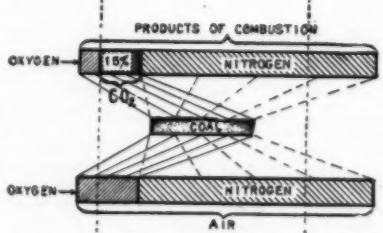


Fig. 4. Chart (b) showing how in excellent practical combustion, with 40 per cent. excess air, the per cent. CO_2 is 15.

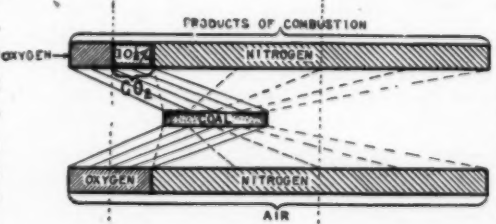


Fig. 4. Chart (c) with 100 per cent. excess air, only half the oxygen is used and the per cent. CO_2 is one-half of 21 or 10½.

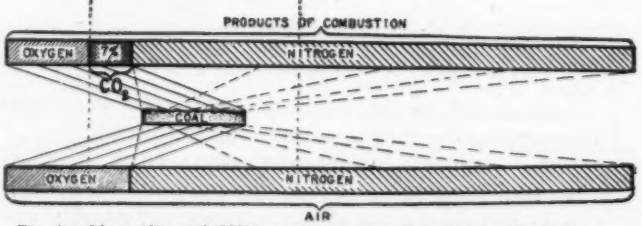


Fig. 4. Chart (b) with 200 per cent. excess air, only one-third the oxygen supplied is needed and the per cent. of CO_2 is one-third of 21 or 7 per cent.

of what is required, as is the case in the average plant, it becomes one of the most expensive raw materials.

All the air that is used in burning fuel, whether under steam boilers or for any other process, appears in the products of combustion. If three times as much air is used as is necessary there will be just about three times as much products of combustion as necessary. This gas as it passes up the chimney contains the major portion of the heat that is unnecessarily wasted. The exact amount of heat wasted in this way can be determined by the weight of the products of combustion per pound of fuel burned, and the temperature at which they leave the furnace or enter the stack. Thus, in the average plant, from one-third to one-half of the heat contained in the fuel is stolen by the products of combustion and dissipated into the atmosphere.

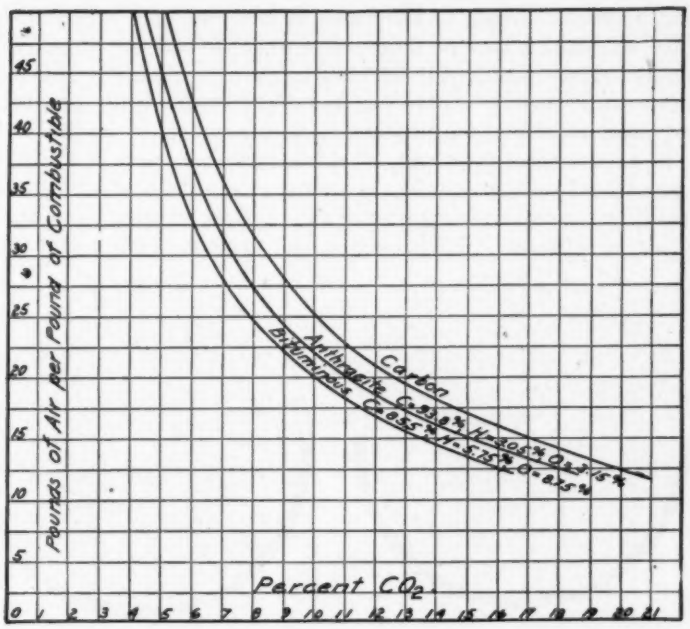


Fig. 6. Chart showing relation of per cent. CO_2 and pounds of air per pound of carbon, of anthracite combustible and bituminous combustible.

Smoke Not Necessarily a Sign of Waste

The other loss up the chimney, namely that due to unconsumed fuel in the products of combustion, is usually not so serious. The old idea that a smoky stack is a sign of tremendous waste is not always true, in fact, whether the gases leaving a chimney are smoky or smokeless is no indication at all as to the efficiency with which the fuel is consumed. Steam boilers, for example, connected with a stack that does not show the slightest trace of smoke may burn twice as much coal per pound of steam generated as when smoke is in great prominence. Black smoke is, of course, unburned carbon, but the amount of carbon in this light and finely divided form that is necessary to give the products of combustion a dark or even a black appearance is generally only a small fraction of one per cent of the actual fuel burned. The additional unconsumed fuel that is apt to be present in the products of combustion is carbon monoxide and hydrocarbons, both of which are caused by an insufficient air supply or the improper mixture of the air with the fuel before it is ignited. Although it is possible for the loss due to this cause to be serious it is a fact that the average loss from this source can safely be estimated as less than two per cent. Figure 3, based on a representative test, gives a good idea of what becomes of the total heat in the coal and particularly how large a proportion of it is dissipated as sensible heat in the products of combustion.

Heat Carried Away by the Dry Chimney Gases Per Pound of Combustible

POUNDS OF AIR PER POUND OF COMBUSTIBLE AND CORRESPONDING PERCENTS CO_2	TEMPERATURE OF CHIMNEY GASES, DEG. FAHR.							
	LBS.	300°	350°	400°	450°	500°	550°	600°	650°
	12	750†	905	1060	1216	1370	1528	1683	1840
	21%	5.2‡	6.2	7.3	8.7	9.5	10.5	11.6	12.7
	15	865	1112	1305	1498	1679	1880	2072	2262
	16.8%	6	7.6	9.1	10.3	11.6	13.0	14.3	15.6
	18	1004	1321	1550	1778	2010	2235	2460	2692
	14.0%	7.3	9.1	10.7	12.2	13.9	15.4	17	17.9
	21	1266	1530	1785	2060	2320	2582	2846	3118
	12.0%	8.7	10.5	12.3	14.2	16	17.8	19.5	21
	24	1440	1740	2040	2340	2640	2940	3240	3540
	10.0%	9.9	12	14	16.1	18.2	20.3	22.4	24.4
	27	1611	1950	2281	2620	2948	3291	3628	3962
	9.3%	11.1	13.5	15.7	18.1	20.4	22.7	25	27.4
	30	1785	2160	2530	2900	3270	3641	4016	4396
	8.4%	12.4	14.9	17.4	20	22.6	25	27.8	30.4
	33	1957	2362	2779	3180	3589	4000	4405	4820
	7.6%	13.5	16.3	19.3	22	24.7	27.6	30.5	33 2
	36	2130	2579	3020	3461	3910	4350	4798	5290
	7.0%	14.7	17.8	20.8	23.9	27	30	33	36.6
	39	2300	2781	3261	3743	4220	4700	5180	5670
	6.5%	15.9	19.2	22.5	25.8	29.2	32.4	35.7	39
	42	2479	2999	3508	4023	4540	5052	5570	6100
	6.0%	17.1	20.6	24.7	27.7	31.3	34.8	39.4	42

* Gebhardt Steam Power Plant Engineering.
† Heat wasted in B. t. u.
‡ Heat wasted in per cent. of total heat in coal.

Fig. 5

Instruments Detect Chimney Losses

It is not the object of this paper to discuss any particular method of burning fuel. To minimize chimney losses, no matter what means is used, we must know whether or not the proper amount of air is being supplied, whether or not air is mixed with the fuel before it is ignited, and whether or not too much heat is left in the products of combustion as they pass up the chimney. Under all conditions these important facts can be determined by consistent flue gas analyses and temperature measurements. Insofar as stack losses are concerned, the effect of any change in fuel or method of firing, the results of any

additions or changes, or the value of any new appliance, can in this way be determined at once, and the best efficiency under the working conditions of any plant can generally be obtained and maintained without the necessity of lengthy and elaborate tests.

In ninety-nine cases out of a hundred, excessive loss of heat up the chimney is simply due to lack of facilities for determining whether the proper amount of air is supplied. When carbon, the principal constituent of any fuel, is completely burned the result is carbon dioxide (CO_2). Complete combustion occurs when air is supplied in excess of what is needed. When, however, the air supply is reduced too much so that it is little more than that which is theoretically required, there is also a possibility of incomplete combustion due to an insufficient amount of air reaching part of the combustible. When this is the case, some of the carbon in the fuel will become only half oxidized; that is, it will burn to carbon monoxide (CO) instead of to CO_2.

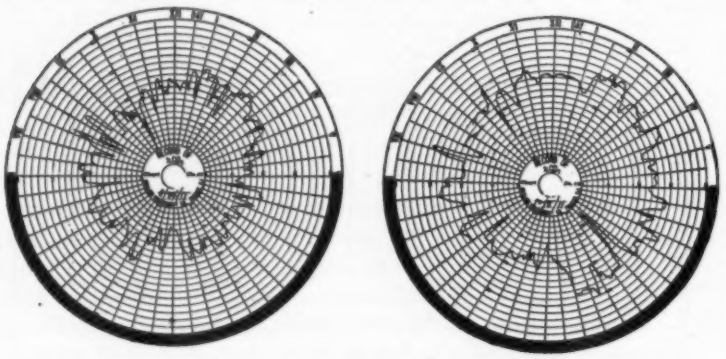
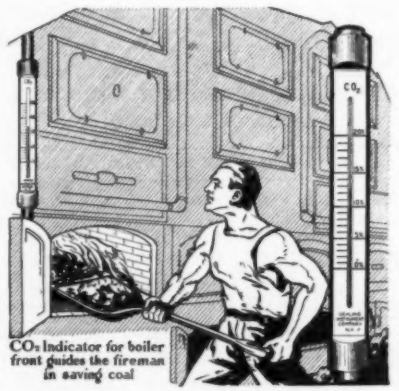


Fig. 7. Two CO_2 charts from a Uehling CO_2 meter installed in a New England plant. The chart at the left was obtained shortly after the installation of the machine, when the per cent. CO_2 (as averaged from the chart) was 8.18% and coal consumption 11 tons per day. The second chart obtained a few weeks later shows 11.75% CO_2 and coal consumption was 10 tons per day.

Carbon Dioxide in Flue Cases the Key to Wasteful Air Supply

It must be remembered, however, that the big loss in practice is due to excess air and not an insufficient air supply. In order to clearly illustrate the importance of this fact, let us consider carbon as the fuel we are burning. Since carbon is the principal constituent of all fuels, the same reasoning will also apply to any other fuel, the principal difference being that the maximum obtainable percentage of CO_2 is less when fuels higher in hydrocarbon are used, due to the fact that hydrogen consumes oxygen to form water vapor (H_2O) instead of CO_2. Thus, if one pound of carbon were consumed with the exact amount of air required to completely burn it, the twenty-one per cent of oxygen in the air used would combine with it and appear as twenty-one per cent CO_2 in the products of combustion for the reason that oxygen combines with carbon to form an equal volume of CO_2. On the other hand, if the same weight of carbon were consumed with twice the amount of air theoretically required to burn it, only one-half of the twenty-one per cent of oxygen in the air used would combine with the carbon, the volume of the products of combustion would be twice as much, and the CO_2 content only ten and one-half per cent. Again, if the same weight of carbon were consumed with three times the theoretically required air, only one-third of the twenty-one per cent of oxygen in that air would combine with the carbon, the volume of the products of combustion would then be three times as great as theoretically necessary and the CO_2 content only seven per cent. It therefore follows that the lower the percentage of CO_2 in the products of combustion the greater will be the volume or weight of the flue gasses per pound of fuel burned, and the greater the temperature of this gas as it leaves its zone of usefulness the greater will be the loss per unit of its weight. This is clearly illlustrated by Figure 4. In average steam boiler practice, for example, every pound of flue gas as it passes up the chimney is laden with sensible heat energy to the extent of from 100 to 200 heat units, and since there are from 25 to 30 or more tons of flue gas for every ton of fuel consumed, the magnitude of this tremendous loss can be readily appreciated. What it



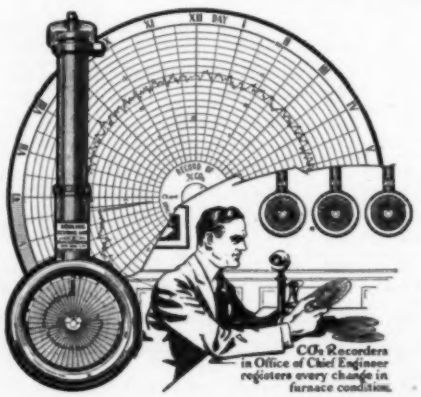


Fig. 8. Instruments for indicating and recording CO_2.

amounts to in actual heat units or in percentage of the fuel used depends upon the percentage of CO_2 and the stack temperature. A table based on carbon as the fuel burned is shown in Figure 5. Such a table can be prepared for any kind of fuel. With fuels such as oil, which are high in hydrocarbons, the maximum percentage of CO_2 obtainable would be less, but every one per cent drop in CO_2 would mean a much greater increase in fuel wasted than a corresponding drop in CO_2 where a fuel richer in carbon is used. The percentage of CO_2 in the products of combustion is therefore an index to the amount of air used per pound of fuel burned, no matter what commercial fuel is utilized. Several illustrations of this fact are shown in Fig. 6. Chimney losses can thus be controlled, at least to the extent which the particular design of furnace will permit, by the simple regulation of the air supplied, so that the weight of the products of combustion per pound of fuel burned will be reduced to a minimum. The two most important constituents of the products of combustion, for determination by flue gas analyses, are, therefore, the percentage of CO_2 and the percentage of CO. The former should be made continuously by means of a CO_2 recorder, while the latter determination is only necessary when the percentage of CO_2 is so high that an insufficient supply of air to all or part of the fuel is suspected.

Chimney losses, as previously stated, depend upon three factors, the amount of excess air in the products of combustion, which is determined by the percentage of CO_2; the amount of unburned fuel in the products of combustion, the magnitude of which is indicated by the percentage of CO; and the temperature of the products of combustion, which can be determined with an ordinary flue gas thermometer inserted in the last pass of the boiler furnace, just before the gas enters the stack.

Of these three determinations the percentage of CO_2 is by far the most important. The percentage of CO_2 is something the fireman can easily regulate. If the brick setting of a furnace or of a boiler is made tight to prevent air infiltration, it is an easy matter for him to decrease the excess air supply to 50 per cent or less by simple cut and dry methods in the regulation of draft, thickness of firebed, etc., even though the excess air supply may have been 200 or 300 per cent before he attempted to so regulate combustion.

The determination of the percentage of CO, being generally of much less importance, need be made only when there is reason to believe that incomplete combustion exists. In fact, the majority of plants where CO_2 recorders are used, get remarkably good results, insofar as economy is concerned, without making CO determinations at all. In other plants, a series of tests are run for determining the maximum safe percentage of CO_2 without the formation of CO and the firemen are instructed to keep the CO_2 as near this point as possible without exceeding it. In many plants, however, the practice of merely instructing the firemen to keep the percentage of CO_2 as high as they can has led to surprisingly good results.

Low Temperature and Small Volume of Chimney Cases Desirable

The third variable, namely the temperature of the products of combustion as they enter the stack, is one over which the firemen have no control at all. This temperature should, of course, be kept as low as

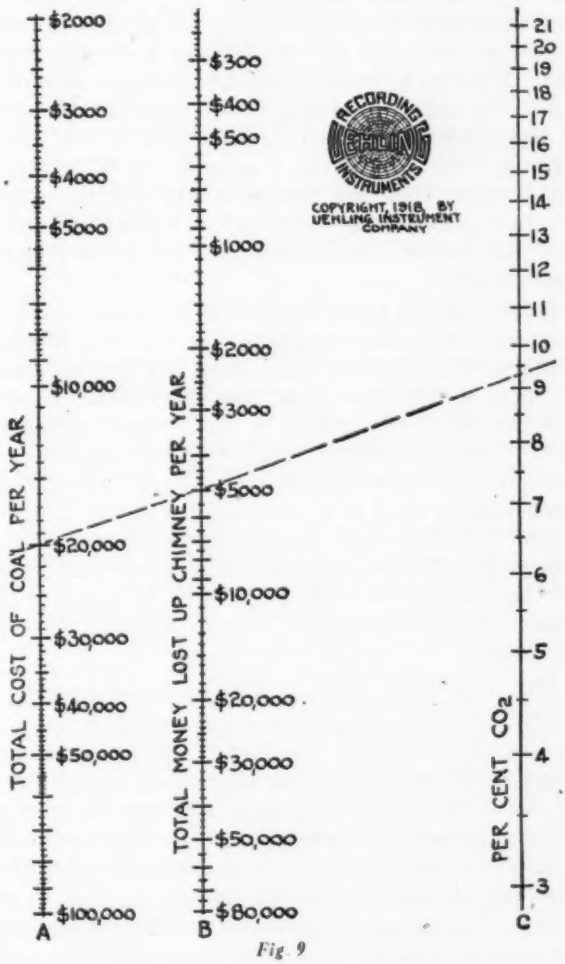


Fig 9

possible but it depends entirely upon how much of the heat in the furnace is absorbed or utilized before the products of combustion make their final exit. In boiler practice, for example, stack temperature depends upon the area of the heating surface over which the hot gases pass and the cleanliness of the heating surfaces. The lower the stack temperature, the less will be the heat wasted; on the other hand the higher the percentage of CO_2 the less will be the volume of flue gas to carry away valuable heat energy as it passes up the chimney. Since the temperature of the products of combustion does not vary materially during short intervals of time, the per-

(Continued on page 1443)

Costs in Woods Operations

By D. A. CROCKER
Vice-President, Eastern Manufacturing Co.
Presented at the Woodlands Section of the American Paper and Pulp Association, on November 12, 1920, at the Congress Hotel, Chicago

I WOULD like to add to the title of this subject the words, "From the Manager's Point of View," for it is wholly from that point of view that I shall approach my subject. I am not an expert cost accountant and hold no brief for any particular system. I do know what I consider essential records, and in discussing these records will perhaps lay more or less emphasis on the methods used in our own organization, not because I consider them perfect, but because they are the ones with which I am familiar. Perhaps another way of stating my subject would be as "Essential Cost Records for Woods Operations."

In the pulp and paper industry as a whole I imagine that cost accounting methods have been as highly developed as in any line of business, and the fact that we have a Cost Section of this Association shows how important the leaders of the industry consider the subject. In spite of this fact, it has been my experience that the woods departments of the various companies, at least in my own locality, are to a large extent following cost keeping methods which, although they give a good picture in dollars and cents of what has happened, do not enable the manager to follow closely the progress of his operations during the season.

This is probably due to a combination of reasons:

(1) The seasonal nature of our operations in the Northeastern part of the United States has made many operators believe that they could not get cost figures in time for them to be of any current benefit. This is perhaps one reason that the Southern and Western lumber operators are, as a rule, ahead of the northeastern operators in this respect.

(2) The influence of climatic variations such as a heavy rain or snow storm or an unusually mild winter is so great as to make anything but very general averages seem valueless to some woods operators.

(3) Added to the above we have the prejudice of the practical man of the general type of our woods superintendents and foremen against any innovations. This is particularly true of innovations which to their mind do not produce pulpwood. The manager of a woods department has, therefore, had to overcome a considerable inertia before he could successfully install the cost records essential today.

Knowledge of Current Costs Essential

What is the essential information for the manager of the woods operations? Boiled down into a few words, it is the current cost of his operations. In order, however, to get this information he must know what his supplies cost, not only at the point of purchase but when actually consumed. He must know what it costs to hire men and transport them to the camps. He must know what these men actually produce and what it costs to board them. He must know the proper charges per unit of time or production to make for horses and machinery, and the amount of his camp construction cost to be charged into the particular year's operations. These are only a few of the larger things which it is necessary for him to know in order that he may follow with some degree of accuracy the current cost of the operations, and in order to do this he must have some good accounting system, and some good men to run it.

I have tried to give some little idea of the current information which I think a woods manager should have. In order to explain one way of getting these results, I am going to tell a little about the system in use in our operations.

Like the old time operators, we start our season's account for an operation with an inventory of supplies and equipment left over from the previous year. In our country this inventory is taken on or about April 1st, and we put the best men in our woods clerical force on to this. It is the final check on the past season's costs and the base for all the next season's costs, and is of the greatest importance. The addition to the April 1st inventory account of all supplies and equipment purchased during the year and the subtraction from this total of the inventory amount of the next April 1st inventory shows the total amount of supplies and equipment used in a given season's operation.

Today the woods manager wants to know exactly what each camp is doing, not only as a whole but also in the various items of work. We get this result in our own system by carrying a sort of supplementary ledger which we know as a distribution ledger. All work in the woods is classified and symbolized. On our payrolls, supply reports, etc. that come in from the woods, all charges and credits are made to the various classes of work at the various camps, and entered in our distribution ledger under the proper account.

Our control account shows a certain operation has cost two hundred thousand dollars. The Distribution Ledger shows how the two hundred thousand dollars was expended. The Distribution Ledger shows the cost per cord of camps and other build-

ings, cost per cord of general expense, cost per cord of pulpwood cut, peeled and fitted, in the long log, cost per cord of pulpwood cut, peeled, fitted, sawed, swamped and piled at the stump, and the cost per cord of wood manufactured in a dozen different ways, showing separately the cost per cord of wood cut by monthly men, and wood cut by cord cutters, not only when the operation is completed but at the end of each week or month.

Now we go one step farther. We not only know the cost per cord of the operation as a whole but we know the cost per cord at each camp in the operation.

We keep the cost of cord cutters wood. We pay them a fixed price per cord for cutting and charge them a fixed amount per day for board, but we are obliged to charge the same price for board as charged by other operators, and we feel that this rate of board is frequently established by some operator who does not know the actual cost of men's board. In arriving at our cost of meals we include:

First, cost of supplies plus freight delivered at the nearest railroad point.

Second, cost of toting supplies to the camp.

Third, cost of handling supplies through storehouses; this charge also includes fire insurance.

Fourth, cooks' meals as well as their labor. There are two items we have not as yet included in our cost of meals that should be. They are, firewood used in cook room when it is hauled and manufactured by some person other than the cook and the depreciation on cooking utensils including cookstoves.

We have a sheet in our Distribution Ledger that shows us the total loss or gain on meals served to cord cutters at the end of each month. This account is charged with the number of cord cutters' meals at the actual cost from our meal reports and this same account is given credit for the amount we receive for meals from cord cutters. This amount is posted from our pay-rolls at the end of each month, and shows us the loss or gain per meal. Sometimes the loss on cord cutters meals will increase the cost of cord cutters wood from ten to twenty cents per cord.

Method for Distributing Costs

The Distribution Ledger is a loose leaf ledger each sheet representing some class of work in some particular camp. For instance, we start building a camp, a name and symbol is given the camp. We head a sheet with this name and symbol, insert it in our Distribution Ledger, and as our reports are received from our operations, the charges are posted to this sheet. These charges are made up of man and horse labor from man and horse pay-rolls. Man meals from cook room meals reports, horse meals from hovel meal reports and material and supplies from our monthly supply reports. When the camp is completed the last item we have is a credit to the camp for material such as roofing left over and returned and tools used in building the camp are returned at their actual value not at the price they were charged to the camp. By treating the charges and credits in this manner, the depreciation on the tools goes into the cost of the camp. When the last posting has been made, this sheet in our Distribution Ledger shows us the total cost of the camp.

Our inventory of supplies and equipment is divided into eight classes; viz., Camp Supplies, Hovel Supplies, Miscellaneous Supplies, Veterinary Supplies, Furnishings, Wangun, Tools and Equipment and Live Stock. The following will give a general idea of the classification although including only a few of the items in each instance:

Camp Supplies consist of all eatables going to the Cook Room.

Hovel Supplies consist of Grain, Hay, etc., going to the Hovel.

Miscellaneous Supplies consist of Horse Shoes, Nails, Roofing, Lumber, etc.

Veterinary Supplies consist of Horse Medicines and Instruments.

Furnishings consist of Spreads, Dishes, Stoves, etc.

Wangun consists of Clothing and Tobacco, etc., sold to our men.

Tools and Equipment consist of Axes, Spades, Saws, Wagons, Sleds, Chains, Saw Machines, etc.

Live Stock consists of Cows, Hogs, Hens and Beef Cattle.

If all of these classes of supplies were treated as one, after we had figured the cost per cord of an operation it would not mean as much to us since we would have Supplies, Tools, Equipment and any money we may have made on Wangun sold to men, all included in one figure. With our classification we can, at a glance, put our finger on any hole. Then we go into the hole, make an analysis of this particular account and show why the cost is high, and can compare with other camps and other years' records. One camp may show tools and equipment costing 25 cents per cord more than another camp, both camps having cut practically the same amount of wood. In such a case we analyze the accounts at both camps and find the reason for the extra cost. An analysis can be made of any of our accounts in a short time, and after we make this analysis, we really use it to plug the hole.

Cost of Keeping Costs

I imagine that a question may arise in the minds of some of you as to the cost of costs. I know of no way in which it can be absolutely settled, but I think that if you will follow me a minute, you will agree that the extra labor employed is not excessive.

For an operation of from 20 to 40 thousand cords, you have to have the following men:

At each camp a camp clerk and scaler.

At each storehouse a storehouse man.

A paymaster for each operation.

A chief scaler for each operation.

A chief clerk for each operation.

How many of these men are you going to get along without in any event? Possibly the paymaster and three out of six of your scalers. If you don't have a scaler on the job at every camp all the time, you are in continual hot water with the piece workers and the scaler is very liable to make errors. We found that regardless of the current production records for costs it was necessary to have a scaler at each camp to keep our crews satisfied. If there, he might as well work all day as part of the time. The camp clerk you must have in any event, and it simply means that he works 60 per cent of the time he would in any ordinary office, rather than about 30 per cent. The paymaster is really a combination bookkeeper, paymaster and assistant head clerk. He would be unnecessary with less detail to handle, but we believe the investment in his salary to be well worth while.

The storehouse men we have at each of our storehouses are essential if we are to know how many supplies we have on hand at any time. They are proving their value particularly this season when supplies are dropping in cost, and we want to carry as small an inventory as possible, and yet keep our camps supplied with everything necessary. Probably the same number of men would be needed in any case, but we could get along with cheaper ones if we did not demand an accurately kept stock ledger and a correct record of receipts and shipments.

Concrete Advantages

Some of the concrete advantages of a good cost accounting system are in the writer's mind as follows:

You get a sure and constant check on the performance of your superintendent and foremen and, most important of all, start them estimating costs intelligently. If the manager tells the superintendent that his wood is costing too much at a camp, but does not back up his statement with figures, the superintendent probably thinks the manager doesn't know what he is talking about. If, however, the manager can show the superintendent through cost figures that some item of his expense seems excessive, the superintendent, if of the right type, can be gotten to use the pencil himself and in such a case will either have to acknowledge his mistake or prove the manager wrong. In either case the desired result has been obtained.

Our system makes the clerks keep their records accurately, because they know that errors are caught within a week or two instead of at the end of the season. It helps them to keep track of their supplies to save us ordering too much or too little of any item.

Our purchasing agent would be lost without his reports from the clerks as to quantities on hand, probable consumption over any given period, and records of past year's consumption per cord and per day, month or year to check the clerks estimates.

The treasurer of the company must make up a budget of his cash requirements not only for a month or two in advance, but sometimes for two or three years in advance. How is he to do this accurately if he has not a good accounting system to fall back on? If we are cutting peeled wood, we will want more money in the summer and he must know how much it should take per cord. If cutting only rough wood, another set of conditions arises. In recent times it has been necessary, because of unusual fluctuations in wages, to have even better basic information than in the past.

We want to make a price with a contractor. How are we to arrive at a figure which will be fair to him and not be excessive for us? Is his camp built or must he build one? How far is his wood from the landing? What is the stand per acre? What allowance will be made to him if wages increase during the season? You want to give him a fair trade, but how are you to know what is a fair trade if you have no good records.

In what I have said to this point I have dealt particularly with the clerical end of the organization. Tied into this must be the work of your forester or forest engineer, if you are to reap the full benefit of your system. He is the man who can give you the amounts to be cut from any suggested camp location, and can frequently locate the camps as well as the superintendent. He can estimate for you the mileage of roads to be built, the cost of dams and other stream improvements and the many other things that require engineering experience. Without him you lose much of the benefit of the information your cost department gives you and close co-operation between the forester, accountant and woods superintendent will yield the best results of all.

Dont Fail to:

1. Keep the heating surfaces of the boilers free from soot, scale and oil.
2. See that the baffling is in good condition and that the gases follow the proper path.
3. Be sure that the boiler settings are tight and free from air leaks.
4. Keep the fires level and free from holes.
5. Use the dampers to regulate the draft.
6. Do not carry the fires so thin or have so much draft as to draw a lot of excess air through.
7. Do not carry the fires so thick or cut down the draft so much as to have incomplete combustion of the coal.
8. Do not soak the coal with water before firing.
9. Be sure the blow-off valves do not leak.
10. Do not have the safety valve popping off continually.
11. Minimize radiation losses by covering steam pipes.
12. Do not allow the waste of steam through leaky traps, valves, etc.

The Selection and Testing of Paper Fillers

E. G. MILHAM, CHEM. ENGR.
Bryant Paper Company

THE question of fillers is of great importance to makers of book papers, since the weight of fillers often amounts to as much as thirty or forty per cent of the total raw material used. The following article is written with the belief that it will give the man in the mill a keener personal interest in the subject of paper fillers and coating materials.

As most papermakers know, fillers, or loading materials, are put into certain grades of paper in order to give it smoothness and opacity, as well as to increase its weight without increasing the quantity of the relatively expensive fibrous material. In this connection, however, it might be stated that the fillers cannot properly be looked upon as adulterants since they give the paper certain desirable characteristics, which cannot be obtained in any other way.

The Fillers Commonly Used

The mineral fillers commonly used today in the paper industry are China Clay, Ground Talc, Sulfate of Lime, Ground Feldspar, and Carbonate of Lime. Many of the substances mentioned above are sold under a variety of pet names, such as, "Pearl filler," "Pearl hardener," "Fibrous mineral filler," "Crown filler," "Whiting," "Snow white filler," "French chalk," etc. The first four names represent sulfate of lime, while the last three represent ground limestone, or carbonate of lime. Of all these, however. China Clay is by far the most important and will consequently be given most attention here.

Requisites of a Good Filler

Before proceeding to the matter of testing, it might be well to consider the requisites of a good filler. In the opinion of the writer, a good filler should have the following properties:—

1. For economic reasons, the moisture should be as low as possible.
2. The color should be a clear bright white. Other things being equal, the value of a filler is directly proportional to its brightness.
3. It should be free from dirt, grit and hard lumps.
4. It should mix READILY with water to form a smooth cream.
5. If the filler is to be used in rosin sized papers, it should not foam when mixed with an excess of alum solution.
6. It should be comparatively insoluble in water, or, in other words, tasteless.
7. It should have properties such as will enable the stock to retain it readily.
8. Obviously, it must help give the sheet the desired finish, opacity, hardness, or "feel."

Testing of Fillers

After the requisites are once well in mind, it is but a short step to the actual testing of fillers. In the opinion of the writer, the most important tests on fillers are: MOISTURE, COLOR, DIRT, GRIT, WORKING, COATING AND FINISHING PROPERTIES, RESISTANCE TO ALUM, SOLUBILITY IN WATER, RETENTION, AND COMPLETE CHEMICAL ANALYSIS. It is seldom necessary, or even advisable to make all the above tests on any one sample of filler. However, no test should be omitted if it will in any way throw any light on the action of any filler under any given set of conditions. The methods used in carrying out the above tests are comparatively simple and are described, briefly, in the following paragraphs.

Moisture

Moisture is determined by weighing about 200 grams of a representative sample of the filler into a flat porcelain dish, which has previously been dried and weighed. After drying to constant weight in an oven heated to 212° F., the filler is again weighed. The loss in weight, multiplied by 100 and divided by the weight of sample taken gives the percentage of moisture in the filler. A Harvard trip scale, sensitive to one tenth of a gram is very convenient for this work.

Color

The color of a filler is determined by comparing it with a set of standards. This sounds very simple indeed; but in reality it is a matter which requires a considerable amount of skill and judgment. The directions given below apply to clay in particular, although the same general principles can be applied to the testing of all fillers. The standards for comparison, mentioned above, are obtained, together with prices, from as a wide variety of colors, ranging from a reddish brown or a dull blue-gray to a clear bright white. They are all carefully compared, as described below, and arranged, as nearly as possible, in the following order: (1) Bright white. (2) Bright blue-white. (3) Bright red-white. (4) Bright yellow-white. (5) Dull red-white. (6) Dull blue-white. (7) Bright brownish-white. (8) Dull blue-gray. (9) Brown. (10) Dirty yellow.

If the prices (f.o.b. mill) on the clays composing the set of standards, have all been obtained at approximately the same time, they can be calculated as percentages of the highest priced clay and arranged

accordingly. The price classification should be very nearly parallel to the color classification. In other words, if three clays, for example, fall in positions 1, 4, and 10 in the color classification, they should have practically the same positions in the price classification. The obtaining of an adequate and accurate set of standards is by far the most important and difficult phase of color testing. This set of standards, when completely developed, is a tremendous aid in determining the relative value of a sample of filler. Of course, after a given grade of filler has been purchased, the set of standards is no longer used on that particular filler since the filler which is received is always compared with the standard sample submitted by the shipper at the time the filler was purchased.

Comparison of Colors

The actual comparison of colors is a matter which requires a little practice, since the accuracy of the comparison depends largely upon the lighting conditions, the moisture in the filler, and the surface of the samples under comparison. The procedure preferred by the writer is as follows: About a teaspoonful of the filler is placed on a clean porcelain plate and worked into a thick paste with a sufficient quantity of clean distilled water. The paste is removed from the plate by means of a clean steel spatula and spread out in a thin layer on a clean white blotter. This layer is then trimmed with the spatula to a rectangle about 1" x 2" and marked. A small sample of the standard with which the clay is being compared is treated in exactly the same way as described above and spread out on the white blotter alongside the original layer. The blotter is then placed in a drying oven and left until the clays are thoroughly dry. They are then compared by a clear north light. The requirement regarding light is very important, since it is absolutely impossible to accurately compare colors in bright sunlight, by artificial light, or by subdued daylight, which is always so much in evidence on dark cloudy days. In this connection, it might be well to state that if at all possible, it is always best to delay testing clay for color until a bright clear day comes along, since it is seldom necessary to wait more than a day or two for the right sort of a day.

Of course, for rough comparisons, it is not necessary to observe all of the above requirements. In fact, it is only necessary to dry the sample, place a small quantity of it on a sheet of white paper, place a small quantity of the standard beside it, and press the two down firmly with a spatula. The colors can then be judged fairly accurately if the lighting conditions are good.

Dirt

Dirt may be determined by weighing out 100 grams of the dried sample into a gallon bottle, which has previously been filled about three-fourths full with clear water. The mixture is thoroughly shaken until a thin milk is formed. The bottle is then filled nearly to the neck with water and after thorough shaking, the mixture is strained through a cheese cloth bag which is coarse enough to let the filler run through fairly readily; the cloth should be fine enough, however, to retain all particles of dirt over 100 mesh in size. After the mixture has run through, about two quarts of clear water are poured into the bag to wash the dirt free from filler. The amount of dirt in the filler can then be judged fairly accurately, although in cases where there is a relatively large quantity of dirt, it is best to remove it from the bag, dry it, and weigh it. A good filler should be practically free from dirt.

Grit

Grit may be determined by means of a simple elutriation apparatus, which consists of a one gallon aspirator bottle, three feet of rubber tubing, and a 14" piece of 3/16" bore glass tubing which has been drawn down to 1/16" bore at one end. The bottle is placed on a shelf four feet above the sink, the rubber connected to the lower tabulature and the 14" glass tube connected to the end of the rubber tube in such a way that the small end of the glass tube will come about ½" from the bottom of the sink. In addition to this, a rubber tube connection is made for filling the aspirator bottle with water, and pinch cocks are put in the lines where necessary.

In runing the test, a 10 gram sample of the dried filler is weighed out into a beaker of suitable capacity. About 100 cc. of water is added and the mixture stirred until a thin smooth cream has been formed. This is rinsed into 500 cc. graduated glass cylinder and the latter is filled to the top with water. The aspirator bottle, the rubber tube, and the glass tube are then filled completely with water. The glass tube is then placed inside the glass cylinder in such a way that it just touches the bottom. The clay mixture is stirred thoroughly with the glass tube, and the pinch cock is opened, allowing the water from the aspirator bottle to run into the cylinder. When one-third of the water has run from the aspirator bottle, the mixture in the cylinder is again thoroughly stirred with the glass tube. It is again stirred when two-thirds of the water in the aspirator bottle has run out. After all the water has run from the bottle, the tube is removed and the cylinder allowed to stand for one-half hour. All liquid down to the 100 cc. mark is then siphoned off through a tube of not over 3/16" inside diam. The remaining 100 cc. is then washed onto a folded 3½" filter paper, which has previously been ACCURATELY counterpoised with another filter paper. The two filter papers are then thoroughly dried and accurately weighed, the weight thus found being the amount of grit in the sample. This is a very valuable test and is not nearly as complicated as it sounds. Grit can, of course, also be

determined roughly by rubbing a small sample of the filler between the teeth.

Working, Coating and Finishing Properties

The working, coating, and finishing properties of fillers are judged by practical laboratory trials. For example, working properties are judged by putting the filler into water and observing the readiness with which it forms a smooth cream. Coating properties are judged by mixing up a small batch of the filler with casein or starch in the same proportion as used in the coating mill. Hand samples are then made from this mixture by means of a small varnish brush. The appearance of these hand samples will indicate fairly closely the coating properties of the filler. Finishing properties are judged by calendering the small hand samples made in judging the coating properties of the filler. These tests, of course, are extremely crude, but they often are of value.

Resistance to Alum and Solubility in Water

Resistance to alum is judged by treating a little of the filler with strong alum solution in a test tube. The mixture should show no signs of foaming when treated in this way.

Solubility in water is determined by boiling a one gram sample of the dried filler in 100 cc. of distilled water for five minutes. The mixture is poured onto a 4″ filter paper which has previously been accurately counterpoised by another filter paper. The mineral is then washed four times on the filter with cold distilled water, care being taken to let all liquid drain through the filter between washings. The filters are then dried and carefully weighed, the difference between this weight and the weight of filler originally taken being the weight of material soluble in water. The water soluble matter in a good filler should be exceedingly low.

Retention

The retention of fillers is calculated by means of the following formula:

$$\text{Retention} = \frac{100\ (A\text{-}a) \times \text{Wt. of dry fibre per beater}}{\text{Wt. of dry filler per beater} \times (100\text{—}A)},$$

where "A" is the per cent ash in the paper and where "a" is the per cent ash in the stock before the loading material is added.

Several other formulas, differing somewhat from the above, have been suggested from time to time. However, it is the writer's belief that the one given is the most satisfactory under average conditions.

By far the most important item in the above formula is the weight of dry fibre per beater. This is sometimes exceedingly difficult to determine, especially in mills where paper stock is used. However, a comparatively accurate figure can be arrived at if sufficient care is taken. The writer's practice in this matter is to find the volume of the beater when filled to a given mark, near the top. This is accomplished by running a couple of beaters sloppy enough to enable them to be dropped without the use of additional water. Just before the plugs on these beaters are pulled, the flow of stock from the beater chest to the machine chest is stopped, and the level of stock in the beater chest carefully measured, by means of a steel tape weighted with a large bolt or plumb-bob. The level is again taken when the beaters have been completely emptied. The volume of the beaters is then calculated by means of the standard formulas. The above procedure is, of course, applicable only in places where vertical chests are used. After the volume of the beater has once been determined, it is a simple matter to determine the weight of dry fibre per beater, since it is only necessary to determine the weight per unit volume, of the stock before loading and to multiply this figure by the volume of the beater.

Retention tests on fillers are of extreme importance because the retention determines largely the economy with which the fillers are used.

Complete Chemical Analysis

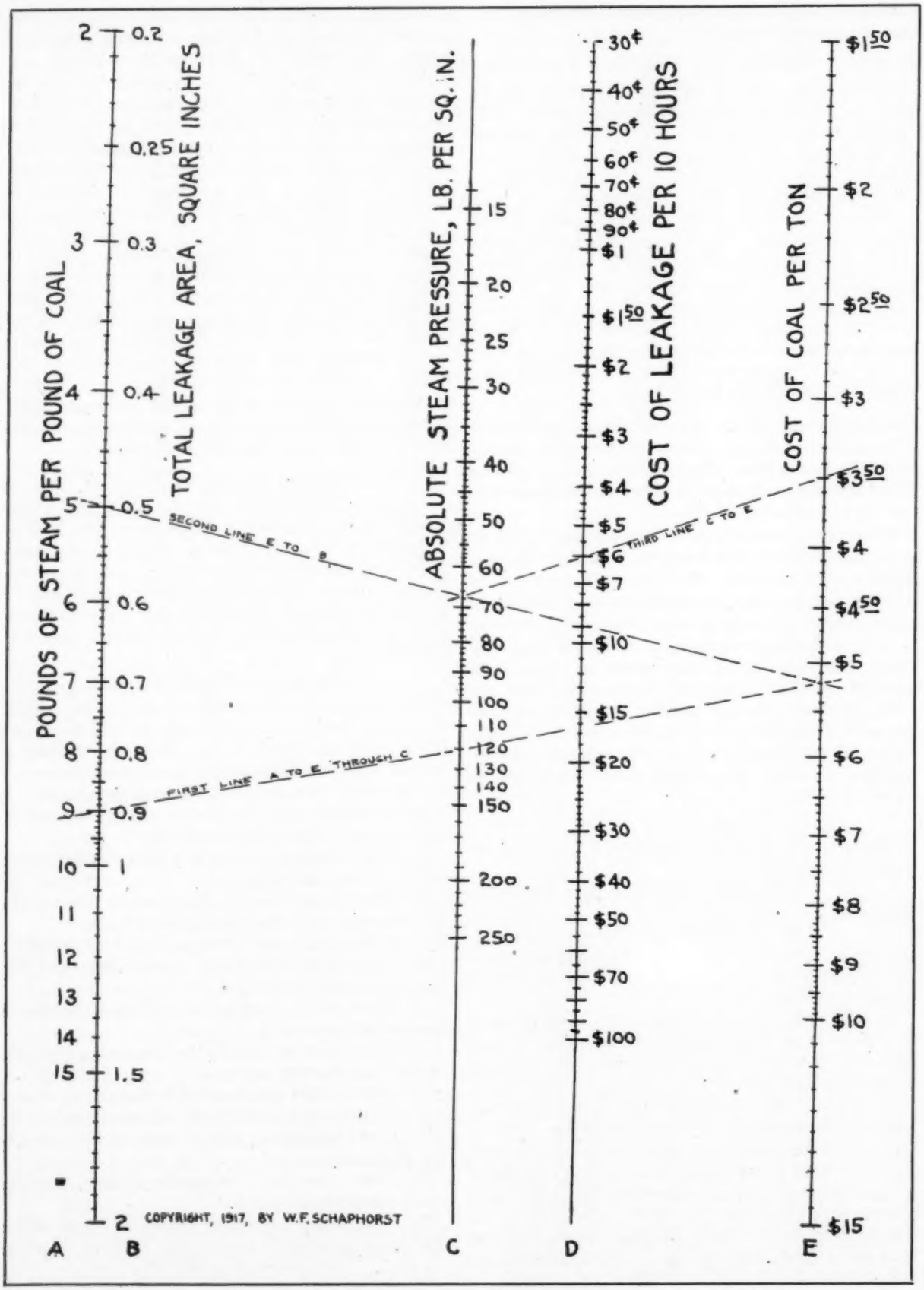
The complete chemical analysis of a filler yields practically no information which is not obtained in the other tests described above. Consequently, complete chemical analyses are seldom made on papermaker's fillers. However, the reader who wishes to make such analyses can always find complete directions in standard works on quantitative chemical analysis.

Selection of Paper Fillers

The selection of paper fillers is a matter which, for obvious reasons, cannot be exhaustively discussed in an article of this character. However, the writer believes that the following hints or suggestions will not be out of place here and will give the uninitiated a clearer insight into the matter of the selection of paper fillers. The suggestions are:

1. Don't pick out too good a filler for the paper which you are making.
2. Don't figure comparative costs on fillers without reducing the latter to a bone-dry basis.
3. Look out for grit in fillers. It is very prevalent and is very destructive, both to the sheet and the papermaking machinery.
4. Look out for hard lumps in fillers for the same reasons as given in 3.
5. Don't pick anything other than clay for soft, opaque, non-dusting papers.
6. Don't pick a sulfate of lime filler without bearing well in mind the fact that its retention will be 40 per cent lower than that of clay, under ordinary circumstances.
7. Don't pick out a carbonate of lime filler for rosin sized papers.
8. Watch out for fillers, especially clays, which have been artificially tinted with fugitive colors or

(*Continued on page* 1438)


POUNDS OF STEAM PER POUND OF COAL
TOTAL LEAKAGE AREA, SQUARE INCHES
ABSOLUTE STEAM PRESSURE, LB. PER SQ. IN.
COST OF LEAKAGE PER 10 HOURS
COST OF COAL PER TON
SECOND LINE E TO B
THIRD LINE C TO E
FIRST LINE A TO E THROUGH C
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A
B
C
D
E

Useful Information for Power Plant Owners and Engineers

By W. F. SCHAPHORST, M. E.

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The first article in the following group by Mr. Schaphorst is an explanation of the chart on the opposite page by which can be computed the "Cost of Leaking Steam" and traces it back to the coal pile.

The Cost of Leaking Steam

TO determine the cost of leaking steam with any degree of accuracy we must know at least four factors—(1) The number of pounds of steam evaporated by one pound of coal. The greater this factor is, the less is the cost of leaky pipes, other conditions being the same; (2) The total area of leakage; (3) The absolute steam pressure, which is equal to the gauge pressure plus the atmospheric pressure. At sea level this is usually reckoned as gauge pressure lb. per sq. in., plus 14.7; (4) The cost of coal per ton of 2,000 pounds.

For example: How much money is lost every ten hours under the following conditions?—9 pounds of steam are generated by each pound of coal; the total area of leakage is ½ square inch; the gauge pressure is 105 pounds per sq. in., making the absolute pressure very close to (105+14.7) 120 pounds per sq. in.; and the cost of the coal is $3.50 per ton.

Simply lay a straightedge across this chart three times as indicated by the dotted lines and the problem is solved. Run the first line from the 9 (column A) through the 120 (column C) and locate the intersection in column E. Run the second line from that point of intersection to the 0.5 (column B) and locate the intersection in column C. From that point of intersection run the third and last line to the $3.50 (column E) and the answer is found at the intersection with column D. The answer is—$6 loss per 10 hours.

In case it is found that the total leakage area is less than shown in column B the chart may be used just as easily by merely shifting decimal points. For example, if in the above problem the leakage area had been 0.05 instead of 0.5 square inch the answer would be 60c instead of $6 per 10 hour day.

When using the chart the steps must follow in the order shown and above described. First line—A to E through C. Second line—E to B. Third line—C to E.

The range of the chart is great enough to easily handle any ordinary problem.

How to Spend Less for Coal

WHEN coal is shoveled into a furnace, where does it stop? On the grates, of course. Are those grates efficient? Are they designed for the most economical combustion of coal? Are you needlessly burning money on your grates? With coal skyrocketing in price these questions should not be rudely brushed aside. Grates are worth thinking about because they may be either highly efficient or extravagantly wasteful. That's where you put the coal, in the very first step towards converting it into mechanical energy. That's where it lies through the whole combustion process. We do not take it from the grates and put it somewhere else, as we do other materials in turning out products—it "lives" for a few brief moments on the grate, gives a small part of its life to doing useful work, and also gives the greater share to wastefully heating exhaust steam or atmosphere. After death its remains drop through the grate openings in the form of ash.

It is therefore plain that the grate has almost everything to do with the combustion of the coal. That is the place where economy must be effected first of all. I don't know why it is that the grate has practically been ignored by engineers in their efforts for economy in the power plant. It has been pointed out time and again that engineers delight in perfecting engines, turbines, steam lines, condensers, economizers, feed water heaters, and the like, but they keep away from the grate—perhaps because grates are usually so black and dirty. In the process of combustion one can't see any "wheels go 'round" and mechanical geniuses evidently lose interest.

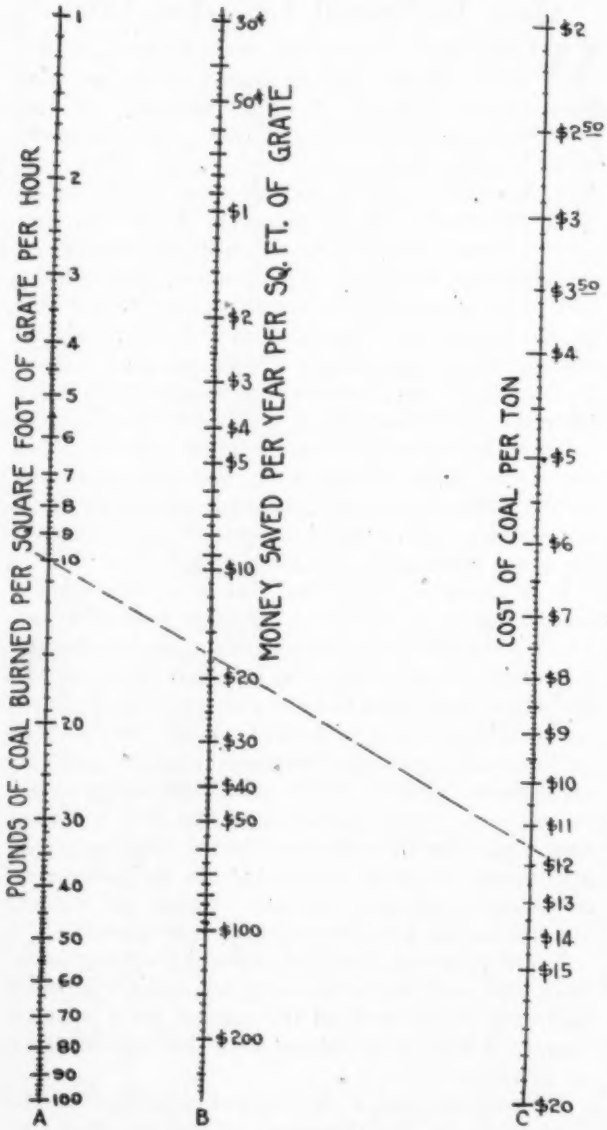
Every little leak, however, is worth plugging nowadays, and as there are so many big leaks in furnace operation I will dwell on the subject for a moment longer. I have some figures here that should prove of interest.

In a letter from J. H. Vought, president of the Cyclone Grate Bar Company, of Buffalo, N. Y., he says, "Cyclone grates will show a saving in fuel of at least 10 per cent over ordinary plain grates in any case. It has gone as high as 20 per cent. We are willing to guarantee a 10 per cent saving over plain grates."

This paragraph alone gives us enough data on which to work. What was your coal bill last year? Are you using plain grates? If so, take 10 per cent of your last year's bill and put most of it in the bank

this year by improving conditions. Or, on account of the present high cost of coal perhaps you can "come out even" this year at least.

Getting down to a concrete problem, let us say that your plant is somewhere near Boston, where it is reported that coal costs from $11.50 to $14 per ton. Let us assume that you run your plant 10 hours per day and 300 working days per year, or 3,000 hours; assume that you burn 10 pounds of coal on your grate



per square foot every hour; and lastly assume that the most economical form of grate can be purchased for $5.50 per square foot. How much money would be saved per square foot per year?

There is nothing difficult about the problem. You will readily figure that 30,000 pounds of coal are burned on a square foot per year. If 10 per cent of this can be saved by installing better grates it is plain that 3,000 pounds of coal would be saved per square foot per year. At $11.50 per ton this amounts to $17.25 per year. That will be the saving at the end of the first year, but it is not the net saving. From it we must substract $5.50 the cost of the grates, which leaves $11.75 as the saving. Thus you could install new grates every year and still make good money. If your grate area is 100 square feet you will multiply this by $11.75 to find the total net saving, or $1,175 per year.

To make the computing work still simpler, I have developed the accompanying chart. Simply lay a straightedge across the chart connecting the pounds of coal burned per square foot per hour (column A) with the "cost of coal per ton" (column C) and the intersection with column B immediately gives the saving on expenditures for coal per square foot of grate area per year. From this subtract the price you will have to pay for a square foot of grate, and you can decide for yourself whether or not it will pay to make any change. The dotted line on this chart shows how the prolem given would be worked out via the straightedge. Column B shows the saving to be $17.25. Even if the saving were only 5 per cent the investment would pay, but inasmuch as 10 per cent is guaranteed I have based this chart on that figure.

Grease Balls

IT WAS brought to my attention some time ago that so-called "grease balls" sometimes form in boilers. They are spherical in shape and have actually been known to assume proportions the size of a league baseball — up to three inches in diameter. These balls form from the precipitated solid matter that is too often permitted to pass into the boilers with the feed water. This solid matter combines with the grease that also sometimes accompanies feed water, usually forming a ball the size of a small pebble or a trifle larger. The three-inch sizes are very unusual. When these balls touch the boiler shell they are liable to stick, insulate the shell, cause undue heating, and as all engineers know, the boiler may bag or burst as a result. The best remedy for this, of course, is to keep grease out of the boilers by means of separators, extractors, and to precipitate the solids outside of the boiler.

Feed water problems are much better understood now than ever before, and there is little excuse for permitting grease or any scaling or solid substance inside of a boiler shell. Don't go ahead and use a certain water without knowing what it contains. Send it to a "feed water doctor." In this connection in may interest readers to know that in the building of condensers our manufacturers are nowadays testing the water that is to be used for cooling purposes before making the tubes in order that corrosion-resisting tubes will be provided in the condensers. The tubes are usually made of brass, yes, but even such

tubes are subject to corrosion, and in some localities must be renewed once every year even after being made in the most scientific manner known to man.

Handy Chart for Comparing Cost

THIS chart will be found handy for determining the cost per month of the various materials used in and about the engine room. It is a good thing to keep tab on supplies purchased so as to know when bought and when replaced. Then by dividing by the number of weeks, months, or years of service, the cost per month is found and the engineer can decide whether or not to purchase the same thing again.

For example, let us assume that a certain engineer bought what he thought was a good grade of packing. He packed his pumps with it, and found the total cost to be $80. After eight months the packing was worn out and had to be replaced again. What was the cost per month? That is an easy one, and can be done mentally, but just to show how the chart works, I have selected an easy one for a starter. The dotted line drawn across the chart shows that you merely have to lay a straightedge across connecting the $80 (column B) with the 8 (column A) and the extension of the line cuts column C at $10. In other words the packing costs $10 per month.

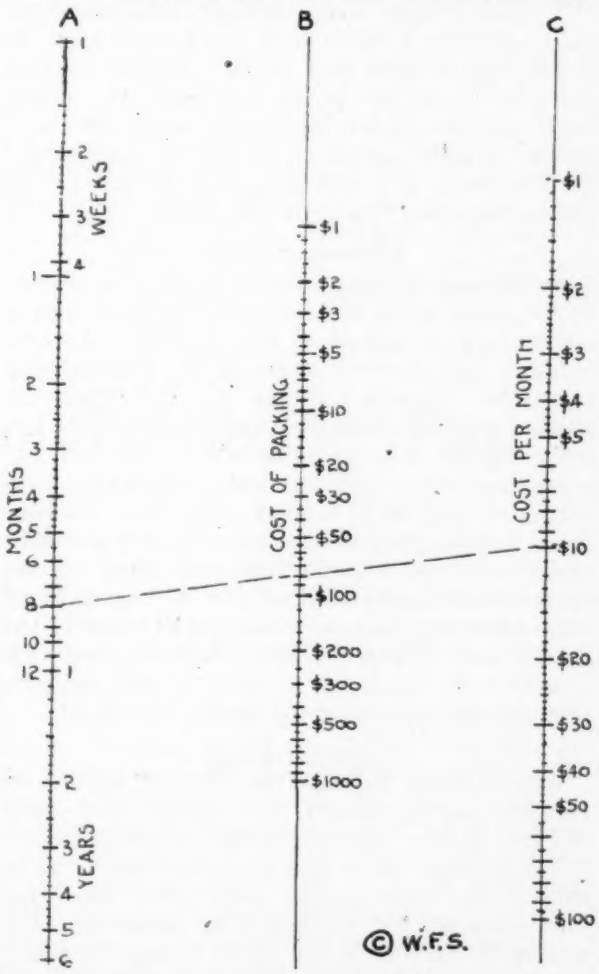
The engineer now sees a given packing advertised which, it is claimed, will last much longer, but its first cost is more. He might naturally say to himself without figuring at all, "That costs too much. I can't afford it. Guess I had better use the same old packing." However, the engineer leisurely lays a straightedge across the chart connecting the claimed length of life (two and one-half years) with the estimated cost ($200) and he finds to his surprise that such a packing would cost him a trifle over $6.50 per month. He rubs his eyes. He tries again. He thinks there must be something wrong with the chart, and "dopes it out" longhand only to find that the chart, after all, is pretty accurate. As a result he purchases the packing, which costs more at first, but considerably less in the long run. It is evident, therefore, that the chart is a valuable one and it would be well to keep it in a handy place whenever looking through advertisements or whenever purchasing supplies.

The chart applies not alone to packing, but to anything that wears out in a short time. Gaskets, cylinder oil, belt treatment, belts, valves, grate bars, etc., all come under this head. Even though the exact cost may not be given in column B it is a simple matter to shift the decimal point in such a way that the correct answer will be obtained in column C. Thus, if you bought only three cents worth of waste, and if it lasted four weeks, you would connect the four (column A) with the $3 (column B) and the line cut through the $3.50 in column C. It is evident that in writing three cents with a dollar sign in front of it, it becomes $0.03. The decimal point is, therefore, shifted two places to the left in column B, and at the same time the decimal point must be shifted the same number of places to the left in column C, which gives us 3½ cents per month as the answer. The range of the chart, it will be noted, is wide enough to care for every ordinary case of supply purchasing.

Stopping Belt Slip with Cutting Edges

IN A little discourse on belts and pulleys and belt slip, I heard an interesting account a short time ago I believe is worth chronicling.

A certain belt man, who was called "Stubborn," decided that he could stop the slip of a leather belt in his charge by making the pulleys rough. Comrades advised against it, but he headstrongly procured a chisel and nicked the cast-iron pulleys all around so that they were indeed rough. His treatment seemed to have the desired effect for a while, and he completely ignored his fellow workers for a time. He



looked on them aloof. In one week, though, the belt that was once a good leather belt was all chewed to pieces. It had to be replaced. The pulleys, also, had to be replaced.

If there is any slip in a belt it is best not to have any cutting edges on the pulleys, and even if there is no slip there is creep, and creep itself would destroy the belt in time. It was declared by the narrator of the above that by the end of the week the pulleys had already been worn down considerably smoother, and another belt would perhaps have smoothed the pulleys back to their normal condition, but it was decided that the method was too expensive.

Forced Draft vs. Induced Draft

MANY engineers, not to mention owners and managers of large plants, are not conversant with the advantages of forced draft over induced draft. It is generally thought that one is "about as good as the other," but that is not the case. The writer has delved into the subject to no little extent and is inclined to place himself on the side of forced draft. I will endeavor, in a brief manner, to give the principal reasons why I favor forced draft.

Chimney Draft

An ordinary chimney "works" because the column of hot gases inside the chimney is lighter than a similar column outside of the chimney. An unbalanced force is therefore set up and in an attempt to balance things in a natural way the outside air rushes into the base of the chimney forcing the hot gases upward and out. But some engineer conceived the idea of making the rushing air pass through a fuel bed to support combustion, and thus the supplanting air itself becomes hot and is pushed up by more cool outside fresh air. And so the operation continues automatically as long as there is a higher temperature in the fuel bed than in the outside air. Chimney draft is induced draft. A so-called "partial vacuum" exists in the chimney, over the fire, and under the fire in the ash pit.

Induced Draft

Induced draft imitates the chimney method by creating partial vacuum over the fire and under the fire. It is a "suction method." Its best feature lies in the fact that it does not force flame or gases out of the boiler at any point. But even that "favorable feature" is chalked up as an argument against it, because if the boiler setting is leaky, surplus air will be drawn into the gases which will necessarily be heated. The heat absorbed by this surplus gas will therefore have to go up the chimney as pure waste. Besides, with induced draft, there is no way to determine in a simple way whether or not the fire is getting too much air.

Again, the fan handling these hot gases will have to be large enough to take care of the increase in volume due to the increased temperature of the gases. When outside air is increased in temperature by 500 degrees F., it doubles in volume. Hence the fan has a "harder and bigger job" handling the air after it is heated than before.

Forced Draft

Already, no doubt, the reader who has never before given this matter thought sees the advantage of forced draft. The forced draft turbo or other blower is so placed as to create air pressure in the ash pit beneath the grates. Nothing but cool outside air is handled by this blower. It is best to regulate this pressure in such a way that there will be no pressure on top of the fuel bed, for if there is greater pressure than atmospheric on the fuel bed, flames will shoot out of the firing doors every time the fireman opens them to feed the furnace. Hence the desirability of using a chimney in conjunction with a forced draft blower. The chimney need be only high enough and large enough in diameter to create a trifling suction over the fuel bed. The greatest pressure difference to be overcome is through the fuel bed and that pressure difference or "draft" is cared for by the blower.

As stated above, less power is required to drive the forced draft fan in handling a given weight of air or gas, but the forced draft system has the further advantage in that its turbine and fan are always in a current of cool air. Consequently, they will naturally be longer lived. This applies particularly to the bearings, for it is much easier to keep cool bearings in economical running condition than to bother constantly with bearings in hot surroundings which must be water cooled in order to keep them running at all. Thus the lubrication problems attending the induced draft system are more complex than those attached to forced draft.

All in all, this is a rather complex problem to handle in a single paragraph or even in a single article. In cannot be stated definitely whether or not a given chimney should be removed and supplanted by forced draft, or whether the forced draft fan should be used in conjunction with the chimney. Nevertheless, if additional power is contemplated it is unlikely that the chimney will ever have to be enlarged provided a chimney already exists. The forced draft turbo blower will usually take care of the matter nicely.

In certain instances, it has been the policy of engineers to keep two or three boilers a-going with one in reserve. The latter reserve boiler would have its fires banked, and the water in the boiler would be kept hot by use of live steam so that as soon as a peak load came along it would be a simple and quick matter to cut the extra boiler into the main steam line. Naturally, such practice is wasteful because of the extra coal required to bank the fires, because of the live steam required to keep the

water hot, and what is more, because of the extra boiler which would have been unnecessary had the other boilers been equipped with turbo blowers.

Steel, at the present time at least, is a scarce article. One excellent way to save steel is to require fewer boilers. Or, if it is thought that another boiler might be necessary in the plant, it is quite possible that a turbo blower will do just as well. In fact, a turbo blower will very likely be a "better" proposition than a new boiler.

How can a turbo blower take the place of a boiler? By increasing the capacity of present boilers. Boiler ratings, in modern times, don't mean much. A boiler may be rated at 100 horse power and in one plant the purchaser may religiously abstain from forcing the boiler one mite higher. Yet, in another plant, the owner or engineer may see an economy in forcing the boiler to 300 horse power. Such things are done every day without evidence of harm to the boilers. In fact, it usually seems to pay to force boilers considerably above capacity.

Then comes the additional advantage of forced draft; by its use you can burn almost any kind of fuel. As one manufacturer expresses it, "you can burn dirt." And now, since so much of the coal handed out to us is practically "dirt" it is almost a necessity that forced draft be adopted. Besides, there is no good reason why a high price should be paid for large lump coal simply because the lumps are so large that air can get through easily via chimney draft when that coal lies on the grate bars. Usually there is but little difference in the heat value of large lump coal and fine coal per ton. So, if the fine coal can be purchased at a much lower price why not buy it, buy a blower, save money, and get along "better" than the owner or engineer who insists on buying the "best" coal. Too many coal buyers are possessed of the diea that the "best" coal has the highest price attached to it, but that is far from the truth. The best coal is the coal that will turn out the work at the least cost. Just what the least cost is may not be an easy thing to compute because so many different factors are involved. Suffice it to say, though, that cheap coal has many times been proved to be the best.

The best way to install turbo blowers is to allow one for each boiler. Don't attempt to put in a single blower and distribute air from it through ducts to each boiler. It can be done, true enough, but blowers don't cost much, and matters are much simplified by installing one blower under each boiler. Then when that boiler is shut down the blower is shut down with it. Also, when operating, the speed of each blower can be regulated to provide sufficient air for immediate necessities. A large single blower for a number of boilers requires constant adjustment and vigilance.

Substitutes for Alum in Sizing Paper

By W. E. BYRON BAKER

SIZING paper in the beater depends upon the decomposition of rosin size solution in the beater by the action of a solution of an acid or a salt containing a large portion of acid in neutralized form. The size solution consists of sodium resinate with varying proportions of free rosin in suspension, depending upon the amount of soda ash originally used in the making of the size.

The decomposition of the size solution consists of the liberation of free rosin in finely divided condition, which takes place because the soda in the size solution has a stronger affinity for the strong mineral acid in the precipitating agent, because strong bases (e. g. soda) have greater affinity for strong acids than for weak acids, the former being dissociated into ions to a far greater extent than the latter are dissociated.

Two substances enter into sizing by the usual method, using alum as the precipitant, namely, free rosin and basic aluminium resinate. This leads us to a consideration of the conditions influencing the character and composition of the size precipitate. It is evident that the precipitant which yields the bulkiest precipitate will be the most desirable from point of distribution of the given weight of size (rosin) among the fibers in the beater, so as to coat each fiber equally. This is, therefore, a factor in the selection of a precipitant, and is quite as important as the other factor, which is the size precipitating power of the precipitant.

Certain other considerations demand some attention in the selection of a precipitant. Among these may be mentioned the character of the water in the beater, with respect to its alkaine or alcid reaction, after the size has been precipitated. In most cases the "back-water" must be somewhat acid in order to insure proper fixation of colors on the fibers and proper running on the paper machine. In certain other cases, e. g. when viscose is added to the beater for sizing and strengthening, the water should be neutral, or very nearly so; in fact, preferably of extremely slight alkalinity.

In addition to the above, it is desirable to take into consideration any effect on the color and strength of the paper which the precipitant may exert. If ferrous sulphate did not exert a bad influence in these respects, there would not be serious objection to

its use as a precipitant. However, in case unbleached sulphite pulp is sized by the use of this precipitant, the iron unites with the residual lignocellulose in the pulp and darkens it considerably. If bleached pulp is so treated the iron reacts in a measure with the rosin, causing another type of discoloration. Furthermore, the strength of the sheet of paper is impaired due to alternate oxidation and reduction of the iron by atmospheric influences, resulting in the destruction of the cellulose by the formation of oxycellulose, which is much weaker physically. The same applies to unbleached pulp. In the lowest grade papers this iron sulphate (copperas) may be used in place of alum.

Alum Is Best Precipitant

As a size precipitant alum is unexcelled, everything being taken into consideration. It produces the bulkiest precipitate of all of the precipitants to be considered because of the affinity of the basic aluminium compounds for water, and their ability to form highly colloidal and gelatinous precipitations by the absorption of water. In size precipitating power it is good. It contains in commercial form approximately 40 per cent sulphuric acid anhydride. In practice, however, considerable excess of alum over the theoretical amount is used, as the precipitation is effected more quickly and more completely.

As a substitute for alum one of the best procedures is the use of niter cake or sodium bisulphate, to replace half of the alum. For every ten pounds alum used ordinarily, use five, and add two pounds of niter cake to make up for the five-pound deficit. This procedure most nearly duplicates the results obtained by alum alone, and is to be preferred to any of the following substitution methods, provided, of course, half the original supply of alum is available.

Niter cake may be used alone as a substitute for alum, but will not produce nearly so bulky a precipitate, and as a result in order to size the paper to the same desired sizing strength, it may be found necessary to increase the amount of size per ton. The quantity of niter cake necessary to be used is variable, being dependent upon its variable content of sulphuric acid. Generally one-half the usual weight of alum will be found sufficient in the case of niter cake. Niter cake, in this case, functions in essentially the same manner as sulphuric acid functions. It is a cheap source of sulphuric acid.

Use of Sulphuric Acid

Sulphuric acid may be used as a size precipitant, but does not produce so bulky precipitate as niter cake. Half as much sulphuric acid as niter cake will be found sufficient.

In the above connections, it must not be forgotten that in some mills, depending upon the character of the pulp, it is impossible to get as hard sized paper as with alum by the application of the above methods. In such cases there is little doubt that the basic aluminium resinate assists considerably in obtaining the desired effect.

Ferrous sulphate is found suitable, provided the defects in color and strength of the paper are unimportant as above noted. The precipitate is more bulky than when niter cake alone or sulphuric acid is used. For instance, in a black or gray packing or lining paper, this may be used very satisfactorily. In fact, it has been used by some manufacturers.

Magnesium sulphate and zinc sulphate may also be used. They form bulky precipitates, have a slightly lower size precipitating power than alum, and, unlike all formerly mentioned precipitants, they leave a neutral "back water" in the beater. This renders them specially useful when viscose is added to the beater. In fact, under these conditions they must be substituted for alum. However, when used in the more usual methods of paper manufacture, some form of acidity should be added in the required amount, so as to have the back water acid, the advantages gained being explained in the fourth paragraph of this paper. As a source of acidity, we may preferably add niter cake solution or sulphuric acid in the required quantity to make the water faintly acid. Avoid a great excess. The water need not be so acid as is often the case when sizing.

Certain other soluble sulphates could be used, but the prices are prohibitive. The chlorides of the above metals could be used and hydrochloric acid, but these are all more expensive than sulphates, or sulphuric acid. All the compounds mentioned as precipitants are approximately the same price or cheaper than alum, taking into consideration the amount which must be used.

Transmission Losses in Paper Mills

(Reprinted from Belting and Transmission)

THE scheme of power transmission which has prevailed in paper mills has a parallel in that to be met with in any other factory of equal or greater size not already equipped with proper drives. A distinguishing difference, however, between the paper mill and the other types of factories is found in the fact that in possibly no other industrial establishment is the percentage of losses due to an inefficient system of power transmission so great as in the paper mill; and, as a consequence, in no other type of industrial establishment is the per cent of saving resulting from properly selected and co-ordinated belting, pulleys and shafting so large. A short time ago a prominent paper manufacturer of the Middle West said, in answer to an expression of surprise from a visiting engineer on discovering some exceptionally inefficient drives in the power transmission of his mill: "I don't wonder at your surprise. I know that we paper men are the worst

old fogies in the business, and I am ashamed to admit it, but we are waking up, and in a few months' time you won't find any conditions like this, in my mill at least. The trouble with us has been that in the past we did so well, even under unfavorable conditions, that there was no apparent reason why we should change these conditions. We simply let well enough alone."

The above statement undoubtedly offers the only possible excuse for the existence of inefficient belt drives and other poor devices for power transmission in an age when much better ones are realized facts, but with the rapid increase in the number of paper mills within the last few years, and the keener competition resulting therefrom, it has become a necessity to reduce the cost of production, and this without lowering the quality of the product. To secure less cost of production means not only an economical administration of all the affairs of the mill, but also the adoption of the modern labor and power-saving apparatus and devices. The best managed mill in the country, if it is handicapped by an antiquated equipment, cannot hope to compete with a modern mill operating under improved conditions.

Oiling Devices and Oilers

Prepared by the Engineering Department of the National Safety Council

PROGRESS in the art of harnessing power has brought with it increasing danger of severe injury and death to the attendants. Safety engineers have realized the hazards thus developed, and a number of efficient devices and methods have resulted—some of them patented.

Shafting

Oiling of shafting should be done, whenever possible, while the machinery is at rest. Better still, the bearings may be fitted with automatic lubricators which need to be filled periodically and then, when the shafting is not in motion.

Sometimes shafting requires attention while in motion and safe means of access should be provided for this purpose. The following means are suggested:

(a) A series platform or runway provided with guard rails and toe boards running parallel with shafting. Moving parts of machinery should not be allowed to project in or cross this runway, but if this is unavoidable, such parts should be enclosed.

(b) A ladder provided with hooks or hangers to fit over the shaft at the upper end and equipped with spurs or safety feet.

(c) The use of a car hung from an I-beam along the shafting, this rail or beam being suspended from the ceiling.

(d) The use of an extension forced feed oil can, which can be operated from the floor.

Direct Oiling

Direct oiling of shaft journals is dangerous and wasteful of material. Self-oiling devices, when practicable, should be installed and carefully maintained.

Oiling Systems

Avoid accident hazards by providing adequate oiling facilities when installing new oiling systems. In the operation of these devices it should not be necessary for oiler to place himself in dangerous proximity to running shafting.

In many plants workmen of special training and long experience are designated to inspect and oil shafting previous to the regular starting time of the plant. This plan has not always proved satisfactory as oilers are sometimes late or delayed in their work, and, should the engineer start machinery while the oiler is engaged in his duties, a serious accident may follow. This hazard can be guarded against, however, where disconnecting appliances permit cutting off the section the oiler is working on, by the oiler cutting out that section and padlocking the appliance so that it cannot be thrown in. If such appliances are not installed, a safe practice is to require that the oiler report personally to the engineer to see that the machinery he is going to work on is cut out and that the controlling mechanism is padlocked. He should again report to the engineer when the work is completed.

Automatic Lubricators

In view of the fact that several states prohibit the oiling of shafting while in motion, the use of automatic lubricators seems the most feasible method of inaugurating safe practices in this work.

Automatic lubricators are often designed to carry a supply of oil sufficient to meet requirements for several weeks or even months. One of the most popular of the patented devices is known as the "capillary oiler." The theory of their construction and a description of their workings follow:

This capillary oiler is a wooden block, with alternate saw cuts through which the oil rises by capillary attraction from the reservoir to the shaft. The law of capillary attraction is definite and positive, and can be relied upon. The capillary oiler is self acting, and takes care of itself. Once in six months drain off the old oil from the reservoir and clean the bearing; then refill the reservoir with new oil, and the bearing will do its work without any further attention.

The capillary oiler is a non-agitating oiler. There is not the slightest whipping and churning of the oil. The oil remains in a quiet condition in the reservoir.

Sediment is permitted to settle at the bottom and only the good, clean oil is brought up to the shaft. There is no clogging of the saw cuts in the oiler.

Ring and Capillary Oiling Rigid Pillow Blocks and Bearings

The methods of lubrication are positive.

The oil reservoirs are large, and shaft wipers return the oil to the reservoir, when it has worked out to the end of the bearings.

One filling of the reservoir will last for several months.

The elimination of constant attendance in oiling the bearings saves a considerable labor charge, and eliminates also that risk of accident and injury to workmen which always exists when men are compelled to work around a rapidly revolving shaft.

Bearings can be secured with dustproof ends, which prevent dust and grit from getting into the bearing surface, when installed in dusty and dirty places.

Ring Oil Bearings

Ring oil bearings are also considered an excellent type, as they are efficient, convenient, reliable, and are probably safer than many other types of self-oiling devices. Rings should revolve with the shaft, constantly feeding oil to the bearings in regular quantities. Permanent devices are used to return surplus oil to reservoirs. A heavy oil should not be used as it is likely to clog and prevent the free rotation of rings.

When it is necessary to fill reservoirs of self-oiling bearings while shafting is moving, care should be used to avoid filling reservoir to full capacity. While a shaft revolves, considerable oil is in the bearing around the shaft. When the shaft stops much of the oil runs down into the reservoir. If the reservoir is already full it will overflow.

Oil Cups

Oil cups are often found in older installations. These may be filled with long-spout oil cans from floor level. Cups are superior to old-style direct oiling, and, like similar devices described herein, soon return cost of installation in saving of oil.

Old plain bearings may often be replaced at nominal cost, using the new self-oiling bearings in the old hanger frames. In the case of oiling devices in which the oil supply is held above the shaft, the oil is used but once and is then lost, while with self-oiling bearings which store the oil below the shaft, the oil is fed up the shaft repeatedly until it evaporates.

The use of an oil cup, as described above, improves lubricating conditions, since it keeps dust out of the bearings, thus preventing wear and saving the bearing.

Oiling Loose Pulleys

Loose pulleys when practicable should have oiling devices so arranged as to permit oiling in any position of loose pulley when machinery is shut down. Self-oiling loose pulleys are, possibly, a bigger safety factor than bearings because of the proximity of belts.

Drip Trays

In many older installations, drip trays are necessary. Trays should be securely attached to hanger and occasionally inspected as several accidents are recorded through falling of heavy trays.

Lubricant will remain interposed between shaft and bearing and will serve its purpose to best advantage in bearings of the ordinary type when the bearing pressure does not exceed that obtained from the following relationship: p. v. = 800, where p. is the pressure in pounds per square inch of projected area (the length of the journal times the diameter), v. is the surface speed of the journal in feet per second, and 800 is a constant derived by Thurston and based on good average practice for bearings of ordinary type. An example of the application for this relationship is: At 120 R. P. M., shaft diameter 2½ inches, v. works out as 1.3 feet per second. Therefore p. will be 800 ÷ 1.3, or about 615 pounds per square inch. If the journal was 5 inches long, the total load on it could be 2.5 x 5 x 615 or 7.700 pounds.

In using self-oiling bearings, the oil will remain in the bearing until it evaporates, except as it may travel out along the shaft, due to capillary attraction existing in the particles of dust which lodge on the shaft. It is desirable to eliminate this waste of oil with the attendant possibility of oil dripping on clothing or material under the shaft.

A ring of cardboard, fiber or similar material somewhat larger in inside diameter than thickness of shaft, will, if slipped over the shaft, travel from pulley to pulley or from hanger to hanger and keep the shaft clean, thus obviating necessity for manual cleaning.

Oilers or others should never approach shafting if wearing loose sleeves, flowing neckties, loose jumpers, etc.

Overalls are now made in the form of union suits, either with or without drop seats. These eliminate many of the loose flying parts of garments and are particularly adapted to the needs of oilers.

Shafting and appurtenances in certain locations, where the generation of static electricity creates a hazard, should be carefully "grounded" to prevent possibility of accident through this cause.

Oiling Machinery

Where practicable, machinery should not be oiled or lubricated while in motion. Gravity oiling systems, automatic lubricators, capillary feeds, oil cups, etc., make hazard from this source, in most instances, unnecessary. In old installations or where manual oiling is necessary in the newer apparatus, oil cans with long spouts can often be used to good advantage.

Guards installed less than fifteen inches from the

machine are usually provided with slide or door for use of oiler and repair man. In some installations it is advisable that these apertures be locked and keys supplied to oilers and repairmen.

While each type of machine presents an individual problem, careful study will reveal a safe and logical method of solving the accident hazard due to oiling.

Form Used for the Instruction of Oilers

Oiler's name.....Date.....

Instructions to Oilers

After being appointed oiler, the foreman of the oilers or his assistant will see that the oiler named above is properly instructed in all things that pertain to the work of an oiler, explaining each of the following rules and giving to him such other knowledge as the foreman deems necessary.

(a) Explain to inexperienced men the need of applying oil to parts of machinery working with friction; for example, a shaft supported by a hanger turns in the bearing part of support. The friction caused by shaft revolving in the bearing box heats the metal of both parts, and, if continued, would eventually stop the turning shaft. Hence it is necessary in order to keep machinery in motion and cause moving parts to slip easily, to apply some form of lubrication.

(b) It is important that an oiler keep the spout of his oil can clear of particles, as dirt might prevent the flow of oil and the result would be dry bearings, although the oiler had supposedly done his duty.

(c) Care should be exercised, when oiling, not to cause overflow, thus filling drip cup and spilling oil on whatever is underneath bearing.

(d) Keep oil holes in bearings clean and free from dirt, as this allows oil to get to shafting and makes shafting slip easily.

(e) The clothing worn by an oiler should be close fitting. There should be no ragged or flying ends, torn, unbuttoned or loose sleeves.

(f) The correct use of step and portable ladders in his work should be explained to the above employe. He should be taught where and how to place a ladder and the correct way of oiling from it.

(g) Do not oil bearings of several countershafts from one position of ladder—change position of ladder and oil those bearings within reach.

(h) Stepladders should not be placed so as to straddle machines in motion.

(i) Care should be taken not to walk or stand on machines.

(j) Idle belts which are hanging about revolving shaftings should not be used as a support in reaching bearings.

(k) When ladder is too short and necessitates straining in order to reach oil cups, report same to foreman of oilers and a higher one will be provided.

(l) Reaching over pulleys or between belts is dangerous.

(m) Belts should not be thrown off with the hands; a belt shifter is provided for that purpose.

(n) All broken ladders and dangerous conditions that may be remedied should be reported to the foreman of the oilers.

Signed .....Signed .....
Oiler. Foreman.

Note: Make out in triplicate; one for the Employment Bureau, one for file in office, and one for oiler.

The Recovery of Waste Roofing Felt

By OTTO KRESS and L. F. HAWLEY
U. S. Forest Products Laboratory, Madison, Wisconsin

LAST year, the Forest Products Laboratory made some experiments on the extraction and recovery of waste paraffin paper by means of gasoline*, and, because of the promising results obtained, it was thought advisable to attempt by similar means the recovery of the waste incident to the manufacture of roofing felt.

Roofing-felt waste, either plain or rock-coated, so far as known at the laboratory, is not being recovered, but is being burned under the boilers. The possible recovery of this stock was brought to the attention of one of the roofing-felt manufacturers, who estimated the daily production of waste felt at his mill to be from 4,000 to 4,500 lbs., or about 2 percent of his total production of felt. At this rate, there would be 50,000 pounds of waste per day in all the felt mills in the United States.

The laboratory was supplied with a shipment of waste produced partly from the manufacture of smooth surfaced prepared roofing and partly from slate-covered shingle-roofing stock. Both kinds of roofing carry approximately 130 percent asphalt saturant and an equal weight of a blown oxidized asphalt as a top coat. The smooth surfaced prepared roofing is coated with 3 pounds of mica and talc per 100 sq. ft. of area, while the shingle stock weighing 80 pounds per 100 sq. ft. carries 25 lbs. of crushed rock per 100 sq. ft.

Some of the smooth surfaced prepared roofing, as well as the shingle-roofing stock, was, preliminary to extraction, cut into pieces approximately one inch square. Extractions 1 and 2 were made on the

*"The Recovery of Waste Paraffined Paper by Extraction with Volatile Solvents," by Otto Kress and L. F. Hawley, in the Journal of Industrial and Engineering Chemistry, for March, 1919.

smooth surfaced prepared roofing, while extraction 3 was made on the shingle-roofing stock.

The experimental extraction for the removal of the pitch was unusual in two respects: (1) the proportion of soluble material (pitch) to insoluble material (fiber) was so high that the amount of solvent required to cover the charge was not always sufficient to dissolve all the pitch; and (2) the solution of the pitch was incomplete even when the solvent was used in excess. It was expected that the gasoline solvent used would not dissolve all the pitch, even when the solvent was used in larger amounts than would be commercially practicable; but, on account of its cheapness and availability, gasoline was used in the hope that the part of the pitch that was insoluble in it would not interfere with the further use of the reclaimed roofing stock.

Table 1. Results from Extraction of Waste Roofing Felt with Gasoline.

Kind	Original material: Soluble in gasoline Per cent	Original material: Soluble in chloroform and gasoline Per cent	Original material: Amount used Lbs.	Extraction: Extract No.	Extraction: Solvent used Lbs.	Extraction: Pitch removed Lbs.	Extracted material: Soluble in gasoline: On basis original Per cent	Extracted material: Soluble in gasoline: On basis extracted Per cent	Extracted material: Soluble in chloroform and gasoline: On basis original Per cent	Extracted material: Soluble in chloroform and gasoline: On basis extracted Per cent
Smooth surfaced prepared roofing	60.1	69.4	40	1	73.9	18.1	3.4	13.2	9.1	35.3
				2	51.9	4.2				
				3	40.4	1.0				
						23.3				
			40	1	60.4	16.3	3.1	12.2	9.1	35.3
				2	44.5	4.5				
				3	45.6	1.4				
						22.2				
Shingle stock	54.5	60.4	60	1	61.9	24.0	4.1	10.6	10.9	28.0
				2	46.4	4.8				
				3	41.0	1.5				
						30.3				

The apparatus used for the extraction experiments consisted of a vertical cylindrical extractor 3 ft. high and 1½ ft. in diameter, provided with a closed steam coil and a steam jet. This extractor was connected with a condenser in such a manner that the vapors of the solvent, when boiled off, could be led to the condenser, condensed, and returned again to the extractor, all in a closed system. In the experiments, a weighed amount of the roofing felt was placed into the extractor, and a measured amount of the solvent (a middle fraction of gasoline, b. p. 90° to 140° C.) was added; then the cover was put on, and by means of the closed steam coils, the solvent was boiled slowly through the condenser, returning continuously to the extractor. The steam was then turned off, and the solution drained from the bottom of the extractor. Fresh solvent was again applied and the process repeated. The solvent remaining after the third extraction and draining was recovered by blowing live steam through the extractor to a condenser and by collecting the mixed condensate of water and solvent.

The results of three series of extractions are snown in Table I. Although considerable amounts of gasoline-soluble material and large amounts of chloroform-soluble material were left in the fiber, yet these were of such a nature that they did not interfere with the opening of the chips or with the running of the stock on the paper machine. Apparently the pitchy, sticky portions of the asphalt are removed by the gasoline treatment, and the material left behind is so hard and brittle that part of it washes off from the fiber during the beating, and the part that remains is not detrimental to the quality of the pulp. In the analyses of the material left after extraction, the gasoline-soluble extract was slightly soft and sticky, but the chloroform-soluble extract was hard and very brittle.* The residue that is insoluble in gasoline acts like an ordinary loading material, offering no difficulty during the conversion of pulp to paper on the machine.

After samples were taken for analysis, the solutions of pitch in gasoline were distilled in a still heated with closed steam coils until very little solvent was coming over, then live steam was admitted into the charge until the rest of the solvent was removed. It was not difficult to make a pitch, apparently as hard as the original, by steaming it a short time with the closed coils heated with 30 pounds of steam.

For the experiment on the extraction of the shingle-roofing stock, the bottom of the extractor was lined with a piece of 70-mesh Fourdrinier wire to prevent any of the stock getting into the piping and valves. The sieve retained the rock and no difficulty was experienced.

The computations for the determination of the amount of solvent and the number of extractions that would be required for a satisfactory commercial operation are complicated by the peculiarities mentioned in the fifth paragraph, but it was found that the results of the experimental extractions still correspond with the theoretical deductions when these

*That even the slightly soft gasoline-soluble residue is not especially detrimental to the stock is shown by the fact that it is removed from the fiber in the paper machine in as great a proportion, at least, as is the brittle chloroform-soluble residue. An analysis of the powdery deposit from the back-water showed two parts gasoline-soluble to three parts chloroform-soluble.

peculiarities are properly included in the theory.* It was noticed that after the first treatment with solvent, the volume of extract removed was nearly the same as, or even greater than, the volume of solvent added, although considerable amounts of solvent must have been retained on the charge. This is the result of the comparatively large amount of soluble material in the charge which, on being dissolved, very noticeably increases the volume of the solvent. The figures obtained during the experiments made possible the determination of the volume of solution retained on the charge after the first treatment, and this volume was found to be greater than that retained after the last treatment as determined by the steam distillation of the extracted chips. This difference is the result of the greater viscosity of the concentrated extract, so that the same amount of fiber will hold back more concentrated extract than fresh solvent. The solvent retained could be determined for the first and third extractions, and for the second extraction, it was assumed to be the mean of the other two values. When such figures were used for the "volume retained" and the solvent ratio was computed from them, the course of the extraction was found to run very close to the theoretical.

Table 2. Comparison of Theoretical and Actual Figures in Waste Extraction of Waste Roofing Felt.

	Solvent Retained			Solvent Ratio			Pitch Removed					
							Cook 1		Cook 2		Cook 3	
	Cook 1 Gal.	Cook 2 Gal.	Cook 3 Gal.	Cook 1	Cook 2	Cook 3	Computed Lbs.	Determined Lbs.	Computed Lbs.	Determined Lbs.	Computed Lbs.	Determined Lbs.
Run 1	3.5	2.8	2.4	3.6	3.3	2.8	18.1	18.1	4.2	4.2	0.95	1.00
Run 2	3.5	3.0	2.6	2.5	2.4	2.9	16.3	16.3	4.5	4.3	1.4	1.6
Run 3	3.2	3.0	2.7	3.4	2.3	2.5	24.0	21.7	4.8	6.8	1.5	1.8

Table 2 shows the relation between the computed and the actually determined values for the amount of pitch removed with each extraction. For runs 1 and 2, these two sets of figures are very nearly the same, but in run 3 the computed figures are high for the first extraction and low for the other two. This indicates that on account of the large amount of material treated (60 lbs. instead of 40 lbs., as in the other runs), the first lot of solvent was probably saturated before all the readily soluble pitch was dissolved, and that the second treatment, therefore, dissolved some pitch and was more concentrated than it would otherwise have been. Furthermore, the high percentage of gasoline-soluble pitch left in the fiber after extraction does not correspond with the amounts removed by the last treatment. In run 1, for instance, cook 3, with solvent ratio 2.8, removed 0.95 lbs. of pitch; it should have left behind only $\frac{0.95}{2.8}$ = 0.34 lbs. of pitch, but the analysis of the extracted material showed 2.04 lbs. of pitch left behind. Probably only about 0.34 lbs. of pitch readily soluble in gasoline was left; the rest of it was difficultly soluble and was removed by gasoline in the analysis only because the analytical extraction consisted of continuous washing for a long time with fresh solvent, a treatment that would tend to remove even difficultly soluble pitch.

For a commercial process, a series extraction, in which about 350 gallons of solvent were used to a ton of paper with four treatments for each charge, should give the same results as were obtained in the experimental extractions. This would make a solvent ratio of about 4, and there would be a theoretical extraction of about 99.71 percent. It should be remembered that this percentage would apply only to the pitch readily soluble in gasoline, and that the gasoline-soluble and chloroform-soluble pitch in the extracted stock, as determined by long and analytical extraction, would be about the same as in the experimental material, namely, 10 percent and 18 percent, respectively.

Recently published results* have made possible the ready determination of the number of cells required to furnish a certain number of treatments in an extraction when the time required for some of the operations is known. If we assume that in a commercial process, the boiling period will be 25 minutes, the pumping period 10 minutes, and the charging, discharging, and solvent-recovery period 80 minutes, then the number of cells required to furnish four treatments will be found from the formula $n=(2c-t)b+c(2c-t-5)p+(2t+4)p$ in which n=time required for charging, discharging, and solvent recovery, b=boiling period, p=pumping period, c=number of cells, and t=number of treatments. Substituting these values in the equation and solving for c, we find c=3. Three cells are, therefore, sufficient to furnish four treatments for each charge under the conditions given.

Under these conditions, also, the length of time elapsing between successive discharges of a cell full of extracted material would be $a=2b+(t+1)p=50+(4+1)\ 10=100$ minutes; that is, if each cell had a capacity of one ton of waste roofing stock, the capacity of the battery would be two-thirds of a ton per hour.

The extracted chips were placed in a beater and opened up with the roll well off the bed plate to pre-

*For a complete discussion of the theory of the extraction process, see "Discontinuous Extraction Processes," by L. F. Hawley, in the Journal of Industrial and Engineering Chemistry, vol. 9, (1917), p. 886.

*"Numerical Relation Between Cells and Treatments in Extraction Processes," by L. F. Hawley, in the Journal of Industrial and Engineering Chemistry, for May, 1920.

vent any cutting of the fiber. The stock readily absorbed the water, the extracted chips having shown by the ink-flotation test approximately the same ease of absorption as was obtained from the original felt. In the case of the shingle-roofing stock, it was found that after the extraction of the asphalt the rock could be readily separated by a mechanical tumbling of the extracted chips. On a mill scale, a suitable duster with a proper-sized screen would no doubt remove the bulk of the rock. The stock from the beater was pumped to the stock chest, then put over a flat diaphragm screen for the further removal of rock, and finally, over an experimental wet machine, the felt being dried and wound into rolls. With the equipment available, it was impossible to produce a felt as thick as was originally used in the extracted material; consequently, no comparative-strength tests were made.

Samples of the felt made at the laboratory were impregnated in one of the saturating tanks at the plant of the co-operating mill. No difficulty was experienced in obtaining a ready and complete saturation, and the co-operators expressed themselves as completely satisfied with the quality of the reclaimed stock.

In a commercial process of this kind, neither the recovered pitch nor the stock would have the same composition as unused material; the stock would contain considerable proportions of the difficultly soluble constituents of the pitch, and the recovered pitch would be lacking in these very constituents. If both were used again, therefore, the final product would be very nearly the same as the standard. The only difference would be caused by the insoluble constituents washed out on the paper machine and lost in the back-water.

A Painter Gun Cuts Cost

By R. C. RUDOLF

PAINTING with mechanical appliances for industrial buildings, tanks, and other large equipment has been a recognized method for years enough to win a firm contingent of supporters and also to array an equally firm support behind the older process of hand painting.

It is a broad indictment against previous progress in the development of paint guns, sprayers, atomizers, etc., that they have not driven the hand painter from the field—even from the portion of the field in which area, speed, and economy are more important than precision. No other process of an equally routine and laborious nature has survived to quite the same extent as painting by hand. Admitting that it will probably survive for a good many years in the better class of decorative work, just as the hand compositor survives in printing and the cabinet worker in the wood working field, there would appear by analogy to be no ultimate place for the hand painter in protective painting, or interior painting.

But he hangs on and his continuance can only be regarded as proof that the problem of mechanical painting is more difficult than imagined by many of those who have offered various shapes and forms of spraying devices.

Some Sprayer Difficulties

A few of the characteristic difficulties of paint spraying are: (1) loss of paint; (2) scattering and splashing over surfaces not to be painted; (3) uselessness in the open air, owing to wide interference; (4) pre-drying of the paint to a chalky consistency through evaporation of its volatile oils while in the air.

These difficulties have operated more or less according to conditions to the type of sprayer and the paint used, but every gun painter, whatever his claims of success, realizes that these are the difficulties to be overcome.

Claims made for a certain, well-known painting device are so far above those made for others that it may be worth while to examine the rather unique principle of this appliance and see what extra efficiency we may justifiably expect, if any.

The problem, as seen by the laboratory of the manufacturer of this device, was to confine the paint jet to a definite radius while in transit from the nozzle to the surface to be painted, to reduce splashing and prevent volatilization. The solution took the form of what might be termed a hollow, conical air jet within which the paint is liberated.

The nozzle has two openings—a central opening for paint and an annular opening around the center from which the air is discharged as a veritable blast under a pressure approximating 60 pounds to the square inch. There are separate conduits for air and paint, terminating in a right angle on each side, which forms an axis for the nozzle and permits it to be operated at any desired angle.

The paint is driven from the central outlet under low velocity and is immediately picked up by the surrounding air jet and carried to the painted surface. The air jet is too powerful for the paint to penetrate. It works in defiance of wind and gravity and, while there is a small amount of spattering from the surface, this loss is small, and the whole tendency is to spread evenly rather than to spatter.

Among the claims for this device are: (1) carrying

a greater volume of paint per minute, due to the fact that it is not finely sprayed but applied in a relatively heavy liquid jet; (2) better penetration of rough surfaces; (3) an efficient brushing action by the air jet which makes it possible to cover completely and smoothly with a single coat, and (4) dispensing with scaffolding very largely by use of a 12-foot arm, when desired.

There is also the important advantage of having a powerful air jet at the painter's command for cleaning of dirty surfaces. Its efficiency in reaching crevices and out-of-the-way corners is considerably greater than that of the hand painter's cleaning implements, the wire brush, putty knife, and cloth.

Any fairly efficient jet system should have an advantage over brushing in the treatment of rough surfaces, such as rock faced masonry, rough lumber, etc., because perpendicular application of the paint is certain to penetrate voids better than brushing across the surface. Take the typical instance of a nail-head or bolt-head protruding a small fraction of an inch from the surface. A single sweep of the Painter films it thoroughly, front, back, and all around, while a hand painter must make several passes with his brush if some part of the metal or adjoining wall is not to be left unpainted.

Accomplishment Records

This Painter has consistently maintained records of 2,000 square feet per hour or more on plain interior work, where conditions were wholly favorable and the operator experienced in his task. It has been quite common for interior painting jobs, sometimes performed by novices, to be accomplished at the rate of 1,000 to 1,600 square feet per hour. In a recent job at the East 55th St. gymnasium, figures that had been preserved at that time and at the time spent in previous hand painting made a good basis for comparison. Panels 104 square feet in size had been hand painted by 2 men at an average of 35 minutes per panel for a single coat. The painting appliance handled by one man did a panel every 5 minutes, and the single application equalled 2 or perhaps 3 brush-applied coats in cover.

Possibly a more striking demonstration was the painting of a huge storage tank on the roof of the new Overland building in Cleveland. This was given a single, but sufficient, protective coating of red in 3½ hours, although the tank had 3,500 square feet of surface. It rose more than 18 feet from the top of the tower on which it was located and no ladders or scaffolding were required. To make the whole test more difficult, there was a high wind at the time. One painter, with the aid of a helper in handling and arranging the hose, did the whole job.

Paint is often less valuable than time, and an example of sacrificing the former to save the latter was the painting of several hundred rods of mesh-wire factory fence with the apparatus herein described.

If the hand painter can see not the "hand writing" but the "gun painting on the wall," he will confine himself to the finer aspects of his craft and leave

volume to the mechanical appliance. Such achievements as those recited here leave as little room for the brush on large surfaces as there is in carpentry for the band saw and plane, or in the newspaper office for a hand compositor on news copy.

The Sign of the Times

The following letter came to our office a few days ago and was in response to a small order for writing paper. It is interesting from the fact that it is the first time we have received such a letter for a number of years, and indicates the trend of the times.

"We acknowledge with thanks receipt of your valued order given our Mr. ——.

"It is pleasing to us to state that we greatly appreciate the opportunity of serving you and it will be our aim to give you our most prompt and careful service at all times.

"Trusting to be favored with your future orders and extending our best regards."

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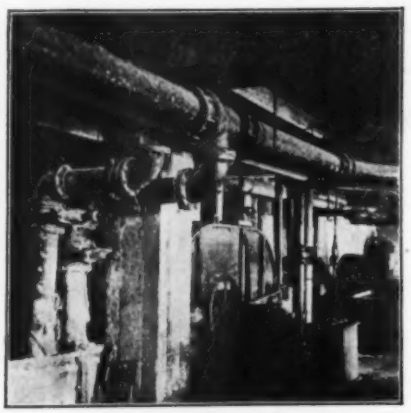

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Testing Tearing Strength

A Reply to a Comment

By S. W.

THE reply of A. E. under "Testing Tearing Strength," which appeared in the columns of your August issue, is very interesting.

Just where A. E. secured my opinion, as he states, that a tearing test is best accomplished by bringing the pressure to bear down on horizontal strips gripped at the ends, is certainly beyond me, for I have never expressed such an opinion.

He says the instrument he developed determines the amount of work required to **make a tear.** This is easily understood but how much work does it take to **start** the tear? Does A. E. realize that various papers vary widely in this particular? Some take many, many times more work to start the tear than to continue it, and papers of the same grade vary widely. Does A. E. not realize that this variation in this particular is of extreme importance? We are convinced that the great majority of users of paper, after consulting numerous ones in a wide range of uses, are more interested in the amount of work it takes to start a tear than to know how much it takes to continue it.

This does not mean that the amount of work necessary to continue the tear after it is once started is of no interest.

I cannot agree with A. E. that the tear strength is the most important property in wrapping, bags and sacks. Countless tests show that the Tensile, Elasticity, Folding or Recoverance properties for certain purposes may be of greater importanie.

I cannot agree with A. E. that it is very desirable to know the average strength. It is of much greater importance to know the weakest point in the edge for that is where the tear will start. It is directly analogous to knowing the strength of a chain—to know the average strength of each link is not reliable information. The most reliable is the strength of the weakest link, for no chain is any stronger than its weakest link. Just so is the edge of any piece of paper—its tearing strength is no stronger than its weakest point.

As for the tearing strength being important, as A. E. cites, in case of puncture, here again the Tensile, Stretch or Elongation, Elasticity, Folding and Recoverance are important factors, and a paper that shows high in a puncture or bursting test may not necessarily show a high tear test.

A. E. makes a statement which seems very broad to me. He says no action whatsoever may occur in practice to warrant the use of static or slow strength tests. This statement, in the face of the fact that practically all tests that are accepted by engineers and scientists today are based on this fundamental principle, is quite startling. Take for instance the standard testing apparatuses that are produced by the most reputable instrument concerns the world over, and in universal use, those made by Riehle, Tinius Olsen, and others for the testing of material —practically all of these are built on the static slow strength principle.

A. E. also says that his instrument permits of several samples being tested, half in one direction of the machine and half the opposite direction. To test in this manner, as I said before, is analogous to obtaining the average strength of a number of different links of a chain. With paper, the break or tear will come at its weakest point, the same as a chain will break at its weakest link.

Would it be difficult for anyone to decide which paper was the safer if he were confronted with these facts: One paper tested say 100-lbs. in the machine direction and 40-lbs. crosswise—another tested 70-lbs. both ways? With the former the average would be 70, but could anyone say that the one which tested the weak way only 40-lbs. would stand as much strain as the paper that tested 70-lbs. both ways? Hardly. The problem is a simple one and one encountered every day many, many times.

In one statement A. E. says that paper is a non-uniform material. In this we heartily agree, though in another statement in which he condemns a tearing test by transverse loading, he draws a very fine line and cites how easily results of tests may be influenced. He calls attention to the mode of gripping but does his instrument not permit of this same possible variable? Referring to his four distinct points of condemnation:

No. 1. He says that these units of weight must be so small that the test ceases to be practical. These tests can and are being made even on a single thickness of tissue with dependable accuracy.

No. 2. The same situation applies, inasmuch as the gripping members, if they are not carefully applied, will naturally cause a variable; however, the average of a series of tests compensates for this variable.

No. 3. His statement "The load bearing down on the center is not a measure of the stress in the paper strip" is impossible of intelligible interpretation. His second sentence is not clear, and his statement "The stress is entirely dependent upon the deflection

(*Continued on page* 1438)

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DU PONT DYESTUFFS

Felt Foes

By B. DENVER COPPAGE

The following article was written some years ago and printed at that time, but on account of the many valuable points in it, and from the fact that it has recently been quoted, we believe it will not only be interesting, but helpful to many of the present day readers.—Editor.

THE actual length of felt life is not the question of importance, but the productive life. The lives of wet or press felts are measured by their ability to withstand two foes or forces which war against them; namely, chemical action and mechanical stress. Both are unavoidably present to a degree in the very use of felts. The utmost care should be exercised to keep both of them at a minimum, for at best they, by their combined efforts, soon put an end to all felts put into service.

If the chemical enemies are unavoidably strong, then all the more need to have the mechanical forces weak, and vice versa, if the mechanical forces are, of necessity, powerful for felt destruction, then it behooves the user to see that the chemical action is as nearly powerless as possible. Better still, keep both these destroyers under subjection to the greatest degree.

We shall merely make casual mention of the chemical destructive forces, for these lie entirely at the door of the user, who lets them in if they get in at all, and are better known to the maker and user of felts, no doubt, than to us. As builders of paper machinery, we are most concerned about and responsible for the mechanical felt foes. We are interested, however, in having felt troubles properly diagnosed and the blame laid at the right door. It is too often fashionable to blame the felt maker for having furnished an inferior article. Chemical actions which destroy felts are more rapid with increased temperature, and more certain when the felts are allowed to dry out, and for this reason felts should be used and washed at temperatures that are known not to be injurious. Soaps and acids used in washing should be of a sort and strength known not to be injurious. Felts may suffer total destruction from chemical action when allowed to dry out when the machine stops. This is one of the reasons given in favor of washing felts on the machine, where they are not allowed to dry out.

A well-known felt manufacturer tells us that the first question asked by them, when short felt life is reported, is "How many days are you running per week?"—they knowing quite well that the less number of running days, the more liable the felt is to get into trouble. Users of felts should obtain advice from the makers of their felts, if they would avoid trouble from chemical foes.

Excessive Tension

The mechanical foes of felts are numerous. The first type is excessive tension. Stress due to drive is in a large part unavoidable. It is readily seen that the felt is a belt and drives many otherwise undriven rolls, all of which act as brakes, or snubbing posts, to which is added, of course, the braking action of suction boxes. It is also evident that the point of greatest stress is next to the driver, at which point the sum of all the "hold-back" is concentrated. This naturally brings in the question of type of bearings and kind of lubrication used on the journals of the felt rolls which are driven by the felt.

A long felt is supposed by many to be better than a short one. This is far from being the fact in most cases. If additional rolls accompany a longer felt, there is no gain; for instance, a 45-foot felt running around nine (9) rolls is no better than a 35-foot felt running around seven (7) rolls. In fact, it is worse on account of the hold-back of the two additional rolls, which evidently adds to the sum of the stress, next to the driver.

If a whipper is used, the stress may, however, be greatest at this point, where each blow of the whipper forces the felt out of a straight line in a reverse toggle action, imposing infinite strain upon the felt which must stretch an equal amount, and if this be near the elastic limit of the felt, it perforce soon goes to pieces by reason of excessive tension. The fact is that the tensions of felts are unknown and are undoubtedly often excessive.

Felt tighteners and stretchers are used to take up slack, but often fail to let it out again except at too great a stress. Machine tenders might take a different view of tighteners if they were called looseners.

It is expedient, we believe, to mount the felt roll next the whipper on springs to relieve the tension; we believe that it is expedient to have recording pressure gauges installed to indicate the felt tension; we believe it is expedient to have recording gauges to indicate the pressure of shower pipe water, and the suction of felt suction boxes; particularly in cases where felts seem to wear out with undue rapidity. These records will be the only means of determining conditions under which the felts are working.

Abrasion

This brings us to the second type of mechanical foes—abrasion—which removes or wears off the nap. Suction boxes not only act as brakes to retard the

Did You Get The Import Of These Messages?

What better proof of the importance of the four messages here reproduced could be desired than the knowledge that—

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motion of felts, and thus increase their tension, but also they will shear the nap quite clean from the passing felt, if they be fitted with covers having sharp-edged holes or slots.

The practice of many mills is to discard the open type of box furnished by the builder and substitute a cover of the Herringbone slot type, which often acts like a safety razor used with a shear cut or diagonal movement. An improved suction box has been designed to avoid such injurious effect as well as spread the felt.

A close shave feels good to the face but bad to the felt.

The nap is also removed by the action of the whippers. These, when made of wood, may become rough, caused by raising the grain of the wood when wet, or from the loss of plugs placed over bolt heads, and thus fret away the nap in stripes, if not all over, which is equally destructive and objectionable; for the removal of nap in any way prevents the felt being reversed once a day. Felts should be reversed daily after washing to assist in the removal of the dirt or filling put in the day before, and also to present a new face for both wear and filling.

An improved felt whipper is now made of brass pipe, and its construction being rivetless, keyless, screwless, etc., insures its not going to pieces or against any projection coming in contact with the felt; only a smooth rounding surface of brass pipe, which is easily renewed when worn.

Whippers should be on the outside of felts, for the felt is knocked away from the dirt or filling, the whipper does not beat the dirt into the felt as some suppose, but it works like beating a carpet with a stick—the most dirt flies out on the switched side. Another good reason for keeping the felt whipper outside is for the convenience of putting on or taking off a felt from the machine, without interference.

Shower pipes, we believe, should be placed on the inside of felts, and by the velocity of the jet action, combined with the whipper action, force all dirt out of the felt on the side from which it entered.

The natural sequence is first, shower pipe; second, whipper; third, wringer rolls; fourth, suction boxes.

Weavers of felts shrink the felt from a width nearly twice the width used in a paper machine, and somewhat longer, then finish it to a given width and length at a working tension, and immediately dry it. This width and length is only maintained under working conditions by the exercise of eternal vigilance.

The Crowning of Rolls

The crowning of rolls is the third type of mechanical foe, and is connected with the pressure between the press rolls and related to the weights used, which cause roll deflection, the crown being supposed to compensate for such deflection. The softness of the rubber covering of one of the rolls acts here as a life preserver, if in good condition and ground smooth and true, and being made of a proper quality or density of rubber.

Age will harden and sometimes crack the rubber, causing distress to the felts which run over them. The crowning causes the felt to run ahead in the center, and to thicken and narrow; to offset this action, rolls are wormed so as to spread the felt and counteract this narrowing tendency.

On account of "dry part" inefficiency, due to poor steam supply or poor condensation removal, or poor ventilation, it is sometimes found that more weight is necessary on one side of a press part than on the other. This causes greater pressure on the felt at one side and may wear out a felt sooner on one edge than on the other. Excessive wearing on one edge of a felt may also be due to a difference in rubber density. This can be checked up by the use of a "Plastometer," and probably corrected by crowning the roll out of center.

Spare the rod and save the felt.

If the paper is formed uniformly across the Fourdriner and properly couched at the one end of the press part, and if the "dry part" is so arranged as to be able to evaporate uniformly across the sheet from front to back at the other end of the press part, then the press part between the two will not need to be manipulated to take care of the shortcomings of either or both of the other parts.

It is, of course, possible that felts may be imperfect or inferior, and this be the whole cause of the trouble experienced, but we believe that most felt troubles are complex and grow out of a number of contributory causes.

Efficiency Means Comfort

EFFICIENCY and comfort are "pals." They are inseparable. At least so it seems on comparing the past with the present and in estimating the future. Man power is inefficient. It is about the best example of inefficiency and absence of comfort in driving a tread mill, in carrying water in pails over the shoulders as the Chinese do, in carrying earth on the head as the inhabitants of India do, in pulling jinrikishas as the Japanese do, or in the other thousand and one manual operations that are so unnecessary nowadays. Before Watt's time, one can well imagine how hard the engineer had to work to keep his engines a-going. They were inefficient, yet letting the engines do the work was a great advantage over making man power do it. The engineer doubtless found comfort in that thought. Watt's engine was a great improvement. It was more reliable and more efficient. The engineer had less to worry about and less manual labor. Comfort, again, increased.

And today, with still higher efficiencies, the engi-

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neer finds real joy and comfort in his work, especially if the plant is equipped in his own pet fashion. He can even wear a white collar if he wishes, and can keep his hands clean all day. An efficient engine room is clean, well lighted, well ventilated, uncrowded, quiet, cool in summer and warm enough in winter. What more could an engineer want, aside from more salary? More pay is always highly desirable with all of us. This same line of reasoning holds equally well in the boiler room. The first steam boiler was a pretty hot affair for the fireman. Likewise it was inefficient. There would have been no comfort at all for the fireman in firing such a boiler. Only Satan could have enjoyed it. But today the fireman is a king in comparison. He doesn't shovel by hand at all. He is a scientist and does his work scientifically. The boilers are all well insulated to keep the heat in and the comfortable temperature out. The fireman doesn't suffer from the heat. And like the engine room, the boiler room is clean, well lighted, ventilated, uncrowded, quiet, cool in summer and warm in winter. When engine and boiler efficiency reach 100 per cent let us, therefore, logically predict that the engineers and firemen of that day will enjoy 100 per cent comfort.

Cost Accounting from an Executive's Standpoint

By HENRY D. SCHMIDT

Vice Pres., Schmidt & Ault Paper Company, York, Pennsylvania

MY belief is that the cost accounting department is the clearing house or central station of all information for the control of an enterprise. It can, and should control the operations of all other departments. It should cater to all and point out and erect the sign posts for the road to success.

Let us pause for a moment and consider this word control. Webster says: "Control is the power to check, direct, influence and govern." But in reality is not control the all important factor which determines earning power and success? Is not control the keynote of any active business? The more intelligently it is disclosed and actively followed up, the more effective the results. It is useless and worthless unless based on and continuously supported by actual facts, dependable knowledge and correct figures to make it absolutely reliable. The progress of a locomotive is only effected by the efforts of the engineer. Just so, your cost department, it can function and control the destinies of your concern, providing your executives have absolute faith, up to the limits of your chief accountant.

What better place to have the control of an enterprise than in the cost department? Is it not the one department that has or should have concentrated knowledge of the workings of all other departments? That's where you cost accountants come in. You can "make" or "break" yourself but, more easily "make" by proper concentration and analysis. You have at your beck and call the most intimate facts and figures of your business, which can be assimilated to make you the best informed person in your concern, and which can be so put together or analyzed, to make this the most valuable feature of your business; in other words, to determine and exercise control.

From a financial standpoint, cost accounts should be tied in with the general books and balanced off or accounted for the same as cash, enabling all to have faith in your figures. Then, a good cost accountant can intersperse his financial data with grouped figures, derived from his costs, which everyone can be sure are dependable . You know it is all very interesting for accountants to follow through a month's tedious detail on some particular operation or group of operations from a cost standpoint, but when all is said and done, the average executive is far more interested from the central standpoint in reviewing a periodic statement of operations properly subdivided.

Take a planning department. In Washington, one branch of the War Department in 1917 created a planning department, whose primary function was to lay out schedules of production and watch progress. It grew and expanded under an able leader until a few months later it was re-christened, "The Control Department," with authority to control the workings of the entire branch.

But there, they had no sales or finances to worry about; and someone else did the manufacturing. That's why, in my opinion, a mill may have an excellent planning department which controls operations and routing, but the real control remains at the disposal of the cost department.

The Budget

Let us see how the cost department, such as I have in mind, can develop and exercise this control. One important feature to any progressive and systematic

(*Continued on page* 1440)

EUCLID TRANSFER CRANES

The illustration shows a 3-ton EUCLID transfer crane in a large paper plant. Only one of the three transfer bridges is shown, the three bridges covering the entire floor. Short spur tracks connect the bridges, making it possible for the hoists to pass from one bridge to another, as desired. Automatic safety locking devices prevent the hoists from running off the transfer bridge until locked in align ment with the spur track and transfer bridge in the adjoining bay. This particular installation has been very successful. Transfer cranes make it possible to cover the entire floor area of buildings, which it would be impossible to cover with a single overhead tra veling crane. An installation of this kind is more economical to install and is much faster and more flexible in operation than a single long span overhead traveling crane.

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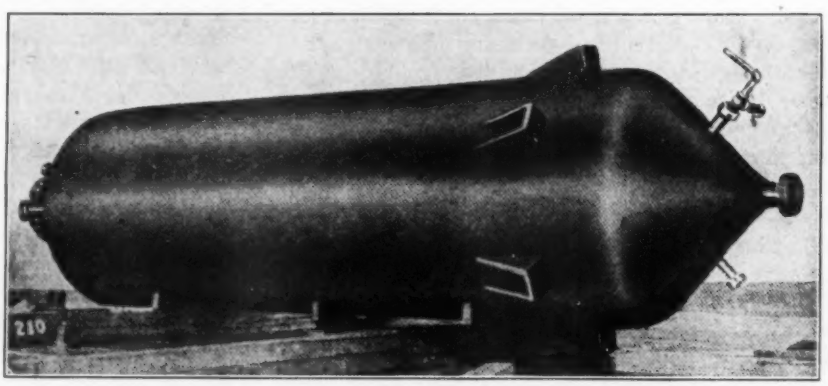

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Some Addresses Delivered Before the Fall Conference

November 11 and 12, 1920, at the Congress Hotel, Chicago

Report of Income Tax Questionnaire Committee

By FRANK H. MacPHERSON
(Detroit Sulphite Pulp and Paper Co.)

Mr. Frank H. MacPherson (Detroit Sulphite Pulp and Paper Co.): Members of the American Paper and Pulp Association, in Convention Assembled; Subject: Special Forest Industries Questionnaire for the Pulp and Paper Industry (Form T-P); Gentlemen: It has been deemed due to the Paper Industry that a final report should be made touching upon the work that has been done since the date of the Income Tax Questionnaire Committee's last report, presented at the annual meeting of the association in New York, April 13, 1920; likewise that a short historical statement should be prepared and submitted to the industry setting forth briefly the various steps taken by the committee through its entire work, to protect the interests of the industry generally.

For the benefit of a comparative few who have suggested that possibly if this committee had not been so "aggressive" or had not gone so far in its efforts to collaborate with the Bureau of Internal Revenue (Natural Resources Subdivision) that the industry might have been spared the time and expense which the preparation of the answers to the questionnaire have required, it is thought well at this point to state again, briefly, some outstanding facts concerning the attitude of the committee in the earlier stages of its existence. These facts have all been stated in previous reports, and have probably been overlooked by the few who have expressed these views. The facts are:

(1) That the Treasury Department (Income Tax Section) came to the American Paper and Pulp Association in the first instance and indicated its intention of sending out a questionnaire and sought assistance.

(2) That such draft questionnaire was submitted to the committee by a representative of the Treasury Department the day following its appointment.

(3) That the committee was unable to satisfy itself that there was any real necessity for such questionnaire, and it accordingly prepared a brief in opposition to the idea, which brief was by a sub-committee presented to the proper officials at Washington, and which brief set forth the opinion that the making up of the answers to such questionnaire would prove exceedingly burdensome and expensive to the industry.

(4) That much of the information requested through the questionnaire as submitted was not germane to the expressed primary purpose of the document as understood by the committee.

(5) That the pulp and paper industry should not be singled out and put to an expense of this sort, unless it were the intention to require like returns from all other industries.

(6) That the members of the committee had not been able to establish in their own minds that such real necessity for the proposed questionnaire existed as would warrant the expenditure of time and money required to carry it to its final conclusion.

The Treasury Department representatives made very plain to the sub-committee which attended at Washington that a questionnaire was conceived to be necessary, and would be sent out in any event; that in order to properly audit the accounts of the years 1912 to 1919, and subsequent years, certain information not in the possession of the Income Tax Division had to be obtained.

Under these circumstances, the committee felt in duty bound to acquiesce to the fullest extent in the request of the Treasury Department, that the industry should collaborate with it in order that a questionnaire might be prepared as simple in form as possible, and yet one which would furnish to the greatest extent possible the information needed for use by the Income Tax Division.

As a result of such collaboration, the committee succeeded in having stricken from the questionnaire all questions relating to (a) cost of inventories; (b) operating costs; (c) that "associated business" should not be included in the list of producers, asked to fill out the questionnaire, and (d) in very materially simplifying the questionnaire as finally submitted, as compared to the original draft.

The elimination of the items "a" and "b" from the questionnaire meant an actual saving to the industry, in time and expense, of hundreds of thousands of dollars, while the relieving of "associated business" (which means waxing plants, paper box making plants, food and other container plants, carton manufacturers, tag manufacturers, paper bag manufacturers, paper towel and napkin manufacturers, envelope and papeterie manufacturers, paper dish manufacturers, tissue convertors, toilet paper convertors, furniture manufacturers (using paper), and the many other industries using paper as a basic product of manufacture, of the filling in of the questionnaire. While this latter was perhaps not a direct benefit to the producers of paper it was, nevertheless, a very valuable service rendered to their many customers.

Regional Meetings

Following the issuance of the questionnaire (Form T.P.) and of the report of the Income Tax Questionnaire Committee in April, 1920, regional conferences were arranged for at various points centrally located, for discussion of the questionnaire, and of the primer, which has been prepared and sent out with the April report of the committee. Meetings were held at the following points and dates: Cleveland, Ohio, May 17-18; Middletown, Ohio, May 20-21; Kalamazoo, Mich., May 24-25; Appleton, Wis., May 27-28; Philadelphia, Pa., June 1-2; Springfield, Mass., June 3-4; Watertown, N. Y., June 7-8; Portland, Me., June 10-11.

The Bureau of Internal Revenue was represented at all of these meetings, with the exception of the last, by Mr. Henry E. Surface, valuation engineer. The industry was represented at the Middletown, Kalamazoo and Appleton conferences by Mr. F. H. MacPherson, chairman of the committee; and at Philadelphia, Springfield, Watertown and Portland by Mr. H. R. Weaver. These conferences were, for the most part, well attended by executives, accountants and auditors of the manufacturers in their respective localities. Very great interest was shown and innumerable questions were asked and answered to the best ability of the government representative and the representatives of the industry. These meetings were a distinct value in setting at rest any feeling as to the necessity, or otherwise, of filling in the questionnaire which heretofore may have existed in the minds of some members of the industry.

Death of Mr. Surface

At this point we should pause for a moment to record the great loss which came to the Bureau of Internal Revenue and likewise to the paper industry in the death of Henry E. Surface, valuation engineer, of the Income Tax Section of the bureau. Mr. Surface had attended the conference at Watertown, N. Y. on June 7th and 8th and was on his way to Portland, Maine, on the night of June 8th, as a passenger on one of the ill-fated trains which were in the accident on the New York Central at Schnectady, N. Y., on that night. The members of the Income Tax Questionnaire Committee who had come most in contact with the late Mr. Surface had formed a very high opinion of his ability, and of his fair-mindedness; he was willing to be shown and to change his views to accord with the opinions of others when he had satisfied himself as to the reasonableness of the position taken by those others. We all regret very much his untimely passing.

Advice has recently been received from the office of the Commissioner of Internal Revenue that a successor to the late Mr. Surface has been named in Mr. Walter Robertson, of New York. We are advised that he has had many years' experience in designing, constructing and re-constructing pulp and paper plants; has appraised mills, including water powers, etc. His experience has, it is stated, been a decidedly broad one in this field and the officers of the Bureau of Internal

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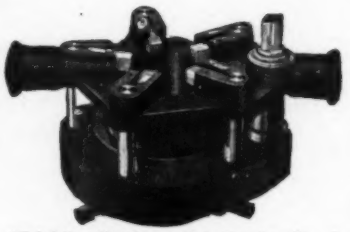

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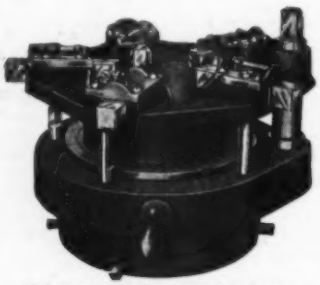

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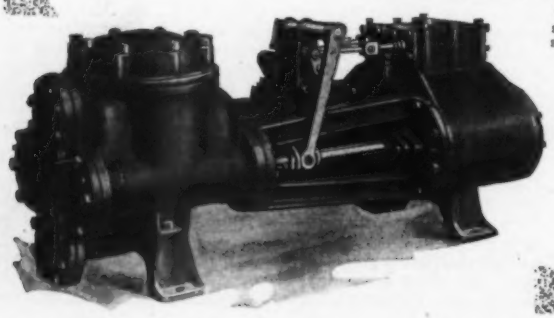

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Responses to Questionnaire

We are informed that blank questionnaires were mailed to 956 taxpayers, and that up to November 1st 281 completed questionnaires had been returned; that extensions of time were granted rather liberally and largely because the death of Mr. Surface made it necessary to postpone consideration of the questionnaires.

Following the sending out of the questionnaire in May last, it developed that the Eastern Paper Board Manufacturers' Association, or some of its members, felt that the questionnaire was not properly applicable to the paper board mills and request was made of the Bureau of Internal Revenue that such mills should be exempted from filling out the form T-P. A conference was held in Washington, D. C., on July 21st when the objections of the paper board mills, or some of them, were set forth. The government position was made plain to the protestants, and its reasons given for including the box board mills in the enquiry. After some discussion, the officers representing the Income Tax Department expressed willingness to permit the protestants to formulate its own questionnaire, acting with some qualified member or members of the Treasury Staff. Just how far this work has proceeded your committee is not advised. Since the box board mills comprise a very large percentage of the taxpayers to whom Form T-P was sent, this will further account for the large number of unanswered questionnaires.

Mr. Stevens, of the Timber Section, who represents the Bureau of Internal Revenue at this meeting, will perhaps wish to speak further upon this point.

Appendices

The committee submits in appendix form (A to K) the various documents, briefs, reports, statements and correspondence and the Primer, which in the order presented furnish a complete historical record of the activities of the Income Tax Questionnaire Committee.

Appendix A—Brief, dated December 6, 1919, submitted by the committee to officials of the Bureau of Internal Revenue (Forest Resources Subdivision) at Washington, D. C., December 12, 1919.

Appendix B—Letter sent to members of paper industry dated December 18, 1919, reporting result of conference with officials of the Bureau of Internal Revenue (Forest Resources Subdivision) at Washington, D. C., December 12, 1919.

Appendix C—Report of Committee on Income Tax Questionnaire, submitted at "open meeting," January 21, 1920, Waldorf-Astoria Hotel, New York City—sent to members of industry as Bulletin 110 (b) on January 29, 1920.

Appendix D—Letter of January 29, 1920, sent to members of industry along with report (Appendix C) dated January 21, 1920, as Bulletin No. 110.

Appendix E—Statement of George W. Sisson, Jr., president American Paper and Pulp Association, on the occasion of the annual meeting of the association, April 14, 1920.

Appendix F—Report of Income Tax Questionnaire Committee, presented at annual meeting of American Paper and Pulp Association, at New York on April 14, 1920.

Appendix G—Remarks by Frank L. Bell, attorney and member Income Tax Questionnaire Committee, following presentation of report Appendix F.

Appendix H—An analysis of the Special Forest Industries Questionnaire (Form T-P) and of the primer prepared by the committee, by H. R. Weaver, International Paper Company, New York.

Appendix I—Announcement dated May 3, 1920, advising members of the industry of regional conferences at various points following the sending out of questionnaire and primer.

Appendix J—Letter of transmittal dated May 3, 1920, which accompanied report (Appendix F) of Income Tax Questionnaire Committee and primer.

Appendix K—Primer relating to Special Forest Industries questionnaire for the Pulp and Paper Industry (Form T-P) prepared by committee representing the industry appointed by American Paper and Pulp Association at request of Bureau of Internal Revenue.

A Worth-While Industrial Activity

By HAROLD A. LEY

(President, Fred T. Ley Company)

Mr. Harold A. Ley: Mr. Chairman and Members of the American Paper and Pulp Association: I think every one of you men will admit the chief asset of your organization is your employes. I think you will also admit that the chief asset of your employes is their health.

The Life Extension Institute, with which I am connected, has been trying for six years to find some way of interesting the employes in the question of health. We started six years ago with a service that was designed for the rank and file in industry, and examined about a thousand men in one of the largest plants of New York and also a thousand men in one of the largest automobile industries. When we published the results of those examinations we found that fifty per cent of the people in both these industries were individuals that were more or less seriously impaired. Five per cent of those men were seriously impaired, men who were in a serious condition. We found ten per cent of them men who should at once come under the direct control of their own medical men. The other thirty-five or forty per cent were men who had serious troubles, that if they were not corrected they would be serious inside of two or five years.

When those statistics were published a great many doctors took exceptions to them, as they thought such a condition did not exist in industry.

The first wholesale examination that was ever made was at the time of the draft. At that time we found that one-third of the boys between twenty-one and thirty-one were not even fit to fight. The results of the draft figures corroborated just what we had found in industry, that your average group of men is not a perfect group of men by any means. They are all impaired with all degrees of impairment, and I believe that if you can introduce anything into your plants that can correct that impairment, you are going to make not only a lot of money, but you are going to do a humanitarian service.

In working out this service for the rank and file, after a year or two we made up our minds that we were tackling this problem from the wrong angle, that we ought to start with the boss instead of starting with the rank and file. He was the man who had to be taught how to live. Take the question of diet alone; Mr. Sisson here is an expert on cattle, and he can tell you, I imagine, exactly what a well-balanced ration is for his cattle. I suppose every one of you men know just what the value of the coal is that goes into your furnaces, but I doubt if there is a baker's dozen in this room who have any idea of a well-balanced diet for a human being.

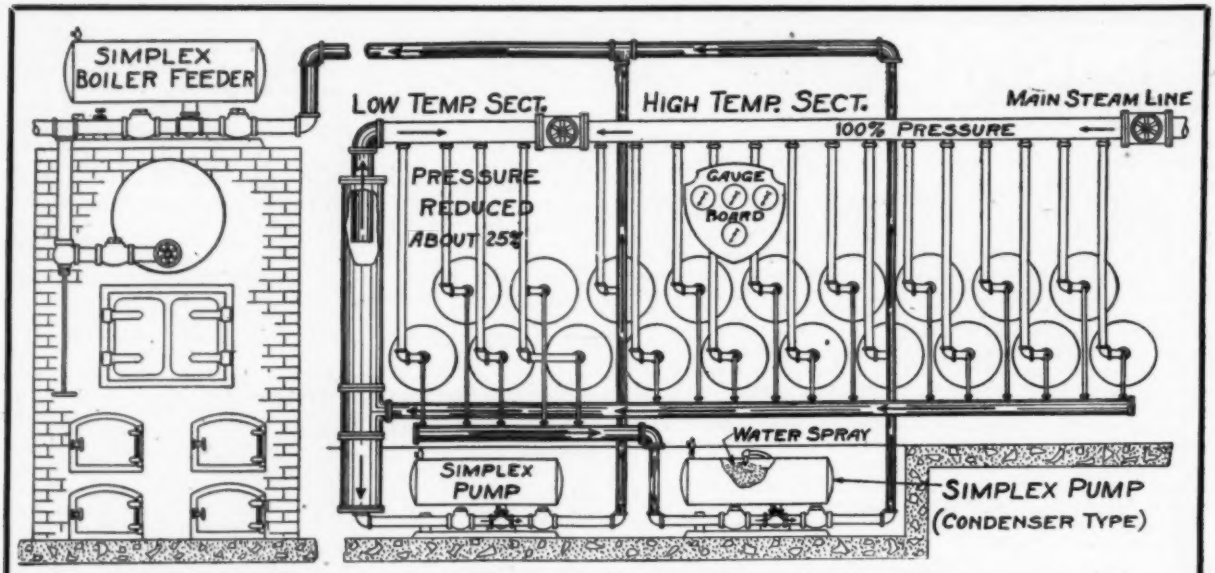
Another thing we discovered and that was that it doesn't do anyone a particle of good to simply make a physical examination. The only good results from this work is by getting the person to follow out the suggestions made, and that is a problem. It is a problem that I believe we have solved.

Employes Health Insurance

A year ago the welfare man in the Fred T. Ley Company came to me and said: "I think that we should give health insurance to our people." We have always considered that the good health of our people is the biggest asset we have. We have introduced a profit sharing plan; we have given them group life insurance; we have given them the service of the institute. When he came to me and said, "I think we ought to give them health insurance," I told him I was all fed up on giving things. I think you are making a big mistake when you give things to your employes. My reason for that conclusion has been that I find in every group when you come out with a notice that you are going to give something to your people, you are coming out in great big announcements that you are making so much money that you want to give it away. There may be fifty, sixty or ninety per cent of your people that may appreciate what you are giving them, and there are some that won't. That small minority will be knocking, but 100 per cent of your people will say, "If you are making so much money, why don't you increase our wages?" and that is a pretty dangerous line of thought for any employer to start among his men.

When I told him how I felt about giving things, he said: "This is something the people want; I think they will be willing to pay part of the expenses." I said I would go fifty-fifty on anything they wanted. I don't think it makes any difference whether an employer can see any results or not, if the employes say they are willing to pay part of the expenses, he can well afford to join with them.

I asked him to find out what he could do in health insurance. We were insured in one of the New York companies, and he came back and told me he could buy ten dollars a week health insurance for eight dollars a year. I said, "That sounds interesting. I think we can work out something along those lines, but we are already at the present time spending ten dollars a year giving our people the service of the institute, and it seems to me that we are entitled to better rates than the concerns that are not doing anything for the health of their people." I said, "You hold your horses and let me see what I can do." I took it up with the insurance company and I proved to them where we had saved the lives of some of our men and improved the health of a great many others,



Showing the Farnsworth Forced Steam Circulation System as Applied to Small Paper Machines, Board Machines or Tissue Machines

Explaining method of installing the Farnsworth System where there is no basement, and also showing the Farnsworth Closed Loop Boiler Feeding System for feeding the condensation from the Paper Machine directly into the boilers under a pressure and at a high temperature, eliminating Boiler Feed Pumps, Feed Water Heaters, Receiving Tanks, Hot Wells, etc.

IT WILL be noted that this Paper Machine is divided into two sections—fourteen of the dryers on the dry end, and five dryers on the wet end. The exhaust steam or live steam enters the main steam line and passes through the dryers into the main return header, and the steam from this main header is passed into the Separator, and the water from this Separator is drained into our Simplex Condensation Pump and the steam passes up to the top main steam header and down into the five dryers on the wet end of the Paper Machine.

If the return header of the fourteen dryers does not supply steam enough to properly heat the five dryers on the wet end to the proper temperature, then the valve on the main steam header between the low temperature section and the high temperature section is opened slightly to build up whatever pressure is best suited to provide the best drying conditions. The condensation from the return header of the five dryers on the wet end section is drained into the Farnsworth Simplex Condensation Pump, Condenser Type. The cold water spray in the top of this tank condenses the vapors, thus pulling the steam and water from the five dryers of the wet end section, forcing a high velocity of steam through these dryers, and, of course, a high velocity of steam is forced through the fourteen dryers on the dry end, because the steam from the return header of these dryers must supply the dryers on the wet end—with the result that all of the dryers on the Paper Machine are heated to the maximum temperature; and to provide better drying conditions the paper hits the dryers on the low temperature section at a slightly lower temperature with a gradual increase towards the dry end.

This system of forcing a circulation of steam through the dryers will heat your dryers at any pressure. In other words, one pound, or even steam less than atmospheric pressure, will circulate through these dryers perfectly, and all the air will be extracted, and all the water will be under a pressure and fed directly into the Boiler Feeder, and thence into the boiler.

THE FARNSWORTH GUARANTEE

The Farnsworth Company guarantee to extract all water and air from the dryers, and to provide maximum drying capacity per square foot of radiating surface in each and every dryer; and also guarantee to provide better drying conditions, and to hold the water under a pressure as it comes from the Paper Machine and feed it directly into the boilers at a very high temperature. That is, at a temperature within a few degrees of the temperature of the steam carried on the Paper Machine.

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FARNSWORTH COMPANY
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Forced Steam Circulation System for Paper Mills
Closed Loop Boiler Feeding System
Canadian Farnsworth Co., Toronto, Canada

and they said they would put their actuaries to work to see if they couldn't give us a special rate. I went home and started to figure what I could do. I found that by an employe paying twenty-five cents a week and the firm paying a like amount, or a total of twenty-five or twenty-six dollars a year, I could give a man a thousand dollars of life insurance, ten dollars a week health insurance that would run for twenty-six weeks, beginning at the end of the seventh day, and the service of the Life Extension Institute. I made up my mind right then and there that was where we would stop giving things, that from then on we would go on an entirely different basis.

Working Out the Plan

I made up my mind it was better to divide our people up into groups according to salary. We arbitrarily set the first group into those earning up to $1,200 a year. They would pay in twenty-five cents a week and receive the thousand dollars and ten dollars a week and the other service. Those earning between $1,200 an $2,500 should pay in fifty cents a week, get $2,000 of life, twenty dollars a week and the service of the institute. Those earning over $2,500 should pay in seventy-five cents a week, get $3,000 of life insurance, thirty dollars a week health insurance and the service of the institute. I felt that would appeal to the older men, especially, and I made up my mind that we could better afford to pay thirty-nine dollars a year for our older and more experienced men than we could thirteen dollars for the new employes. I then made up my mind that the only way to handle a thing of that kind would be to form a mutual benefit society among these people, and it should be optional with every man as to whether or not he should come into the society. To make the society more attractive I told them I would go further than fifty-fifty with them, that I would agree to give them $500 additional insurance to every person that had been with us three years, in addition to the amount they were buying, and one thousand dollars to persons who had been with us five years, and fifteen hundred for ten years and two thousand for fifteen years. In this way the older men were able to get $5,000 life insurance for thirty-nine dollars. We called together a group of older men and put this proposition up to them. We found that certain fellows on account of their physical condition could not buy any life insurance at any price, and it didn't take very much of a salesman to sell those men. I know of certain individuals who had blood pressures of 200 and over; they couldn't have bought a dollar's worth at any price, and when this thing was put up to them they took off their coats and went out to sell this idea to the rest of the men. We told them that we couldn't put this thing over unless seventy-five per cent of our men wanted it. It meant that they had to come back to us with a request from seventy-five per cent of our people to go into this proposition. I think any employer who gets a request from seventy-five per cent of his people to do anything of that kind can't afford to turn it down.

I said to them, "We are not particularly interested in this insurance that you fellows are getting. I can't see where we are going to increase our production by paying your family something when you die, or when you are home sick. As a matter of fact, I believe that some of you will stay at home longer if you are being paid than if you are not, but the one thing I am interested in is your health. I am vitally interested in that, and if you fellows will take an interest in your health and improve the conditions of this group of people, we are going to get enough to pay us for all we are putting in; therefore, we will go back to the insurance companies and we will pay them their regular rates." I want to say right here that I have no interest in any insurance company in any manner, but I believe it is the way to interest the men in the question of health by giving this as a bonus.

I said, "We will go back to the insurance company and we will pay them their regular rates for their insurance, but we will get them to agree, which they have done, that if we can show a better experience than their average group policies they will increase your dividends just so much more." It was a perfectly safe thing for them to do because they were not committing themselves to anything until after we had shown the results of what we could do. I said to the men, "You can have all the money you make from improving your health from your insurance. The firm will pay half the price, but you can have all the results." I think it is the best thing we have ever done in our plant.

Helping the Men to Pay

Our experience has been that in every group there is a certain per cent of the men who cannot afford to carry out the recommendations of our doctor. They haven't got the price. I explained that to the men and told them that the firm would put a thousand dollars in the treasury of the association for them and that that was all I was going to give them, and I wanted them to use that money in any way they saw fit. I told them that if any man in that organization needed any financial assistance, that their executive should decide whether that money should be loaned to them, given to them, or gone on a fifty-fifty basis, or whatever they thought best, but it was up to the men to decide what help they were entitled to.

The men went out and they came back with the request from something like eighty or eighty-five per cent within three or four days.

This proposition has been sold in the last year to thirty or thirty-five different kinds of plants. The paper industry has been pretty well represented. The Laurentide Paper Company in Canada had 1,900 Canadians, about as ignorant a crowd of employes as you could find, and 1,800 of those 1,900 men came back with the request to the management to put this thing in force inside of a week. It took them less than a week to sell this idea in spite of the fact that they couldn't speak the English language. They enlisted the support of the French doctors and priests and they all joined.

We found the men at once interested in this question of health. The service of the Institute comes into this thing in an ideal way. Our services are absolutely confidential between the employe and the Institute. We give no information to the employer or the insurance company. The employer has got to take a service of this kind on faith. I don't think you will be able to introduce any kind of physical examinations in any plant unless they are first optional and then confidential.

The secretary of the association had to arrange for the examination of these men. These men passed through the secretary's hands before and after the examination. This secretary wants to be a person who has a confident and sympathetic attitude towards the employe. Any information that he can gain from his contact with his fellow men he wants to treat confidential. We rate every one of those men "a," "b," "c" or "d," and we find very few "a's."

When a man comes out the secretary asks him what rate the doctor gave him.

"c."

"What is the matter with you, a great big husky fellow?"

"The doctor told me my teeth were bad. He said I had a blood pressure of 170 and my diet was wrong."

"Jim, you had better go to the dentist and have your teeth fixed; that probably accounts for the blood pressure." He goes up to Jim three months later and says, "Have you been to the dentist?"

"I went to the dentist, but I found it was going to cost me $100 to have that work done, and I haven't got $100."

"With your permission I am going to take it up with the association and find out whether they won't loan you $100 and let you pay it back five dollars a month. You were out two or three weeks on account of rheumatism which was probably caused from your teeth, and we are interested in seeing those teeth fixed. We will help you in any way we can to have those teeth fixed, or have those tonsils out or an operation for hernia." A thousand and one things you will find in every plant to be done, and I believe the only way you will be able to get it done is by working through a co-operative organization of that kind.

We find that the total expense is costing us less than one per cent of our pay roll. I find that that is the way the thing works out in almost every plant.

It is fine humanitarian work and that is what I am anxious to see done, and I stand here to recommend that if any plant can introduce a service of that kind they will not only make a lot of money but be doing a fine piece of work and a duty they owe to their employes and to the community.

Development of Interest in Forestry by Manufacturers of Paper

By FRANK L. MOORE

(Newton Falls Paper Company)

Mr. Frank L. Moore (Newton Falls Paper Company): I have not prepared anything; I will simply talk as I might talk to my own people. I hardly know how you expected me to handle this subject in connection with the organization of this Woodlands Section.

I think our problems of forestry should be presented to all manufacturers of paper, whether or not they own woodlands, or whether or not they own their own pulp mills and sulphite mills. The man who buys his ground wood or sulphite or product of the forest is just as much interested in a permanent supply of wood as those of us who go into the woods and cut

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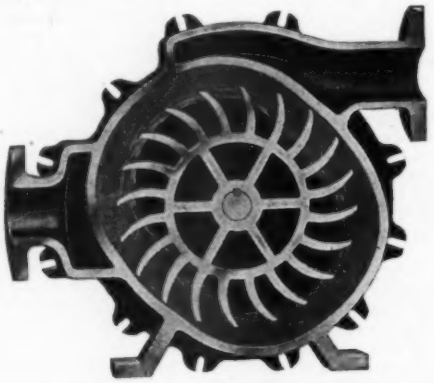

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Swenson Evaporators in the plant of the Mead Pulp & Paper Company

Look at the photograph of the Swensons in the Mead Pulp and Paper Co. plant. One of these units has been in operation for two years—the other for eleven.

They are run **continuously**—day and night—year in and year out.

They do their work well—the owners have no occasion to worry about results when Swensons are on the job.

About 50% of our business in the Pulp Industry is from repeat orders. Soda pulp mill experts speak of Swensons as "America's Standard." Advance design, the materials used in construction, the arrangement and fastening of the heating surfaces and other exclusive Swenson Features are some of the reasons for this indorsement.

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our timber and produce it into the raw material which might be our finished product.

For a great many years I have talked to various groups of manufacturers when occasion has presented itself and tried to emphasize upon them the necessity of showing more interest in forestry and forest products than they have in the past.

In the state of New York they have closed up the forests to the public, and you can't break a stick to build a camp fire without violating our state constitution. The newspaper publishers are interested in getting their paper at as low a price as they can, without any idea that that can only continue for the time being and that sooner or later our forests will be depleted unless some action is taken or something is done to make them reproductive. They are beginning to realize now the folly of the methods and plans which they have pursued in conducting this business in years gone by. I have not very much sympathy for them in a way. Their position reminds me a good deal of a story of a Jew that was carrying a pack around the country for a number of years and finally accumulated a thousand dollars, so he thought it was time to move into town and rent a store and invest his thousand dollars in a stock of goods, and settle down and do business as any other civiilzed man would like to do in his old age. After doing all this he conceived the idea that if he had $2,000 fire insurance he could make another thousand much quicker than he had been able to accumulate his first, so he took out the insurance. One night they looked out across the street and his wife said, "Jacob, there is a fire over there in our store; you must go out and do something or they will think you set fire to it." He ran out, threw up both hands and said, "My God, my God, strike me dead, I am a ruined man." Just then a brick fell off the building and struck him on the head. After he regained consciousness, in the course of an hour or two, he said, "What's the matter with you, God, can't you take a joke?" These newspaper publishers have arrived, in the use of paper, in a position of that kind.

This Woodlands Section, I presume, if it is organized, will be able to gather information undoubtedly in connection with our timber supply, our forest supply, the condition of our lands, whether they are suitable to reforestry, and all that. That is being done to a certain extent in some states now by various state agencies and other organizations. It also may develop and be able to supply us with information such as our Madison laboratory is doing in regard to the yield of pulp from decayed wood or from deteriorated wood. Your Executive Committee heard a very earnest plea day before yesterday from Mr. Everest, who is representing Mr. Wolf in behalf of the Forest Products Laboratory in Wisconsin, in asking for money with which they could go ahead and carry on their work in investigating the wastage in our wood piles.

Forefathers Obliged to Devastate Forests

Of course, we all know we can go back to the Pilgrims where they landed on Plymouth Rock and measure time from the beginning. It is but a few short years ago when they went into the forests and used the natural resources, the wonderful resources the country had at that time, but in doing it, they were obliged to, as we look at it today, devastate forests and clear up lands, and as civilization has grown and population increased, they have gradually gone back farther and farther into the woods until now it is a problem of this country to be able to maintain its natural resources and have its natural resources serve the public.

The time has arrived where nature must be assisted by man. By that I mean that we must advocate a system, a plan of legislation which we outlined to you yesterday, whereby our forests can be made reproductive. Instead of closing up the forests, the decayed trees and matured trees should be cut and give a revenue to the state and be given up for the uses of the people of the state.

It is absolutely foolish for the people of any state—New York State, we will say—to have to go to the Pacific Coast for shingles and to the Southern states for wood. It should be of interest to this section to encourage the development of the growing of woods, make a study of the lands, of the farm lands that are not suitable for any purpose except growing trees, and see that those farm lands are planted so the farmer, when he wants to build a barn, can go out and cut his own wood.

As Mr. Kellogg stated to you, there are about eight million cords of pulp wood used in this country in a year, but you can travel day after day on a railroad train and hardly see a stick of spruce or pulp wood growing. You have got to get away back in the wilds of the unbroken forests to see them. Those are conditions which are arising on account of the enormous increase in the consumption of paper. If you put eight million cords in a pile of four feet wide and twelve feet high, it would reach once and a half across our continent. In a pile four feet high, it would extend thirteen or fourteen thousand miles. Now, that on the average yield per acre of wood, would mean 800,000 to a million acres of timber cut over in a year. We all know that natural growth is not going to take care of anywhere near replacing the consumption of wood that is being used for pulp and paper, to say nothing about the lumber industry and many other industries that are using wood.

Conservation Not Encouraged Under Present Tax System

Another cause perhaps for the devastation of our forests has been the system of taxation. That is a problem that has been studied for many, many years by people interested in our forest lands.

In New York state at the annual meetings of the Forest Products Association for years we have had a student who has made a study of tax problems to talk to us. There should be a system of taxation to encourage a man to keep his forests and cut conservedly. Some day I think we will have a yield tax. That is what we have advocated, those of us who believe in the perpetuation of our forests. That would produce better returns and maintain a forest better than anything else that has been suggested as yet.

I have here a little pamphlet, a sheet of the American Forestry Association which I presume most of you have seen. I want to refer to a few things in here in showing the depletion that is going on in regard to our forests and how long it estimates that the timber in this country will last. We are consuming lumber three times as fast as we are growing it. It is predicted that in ten years the yellow pine of the South will be gone and within seven years 3,000 manufacturing plants there will go out of existence. White pine in the Lake states is nearing exhaustion and they are paying $6,000,000 a year in freight bills to import lumber.

The Board of Supervisors in every agricultural county should employ a forester to study the land conditions on the farms of the county, and then report the lands that are only fit for growing trees, and have the farmers plant trees there and see that they grow to maturity.

Fires destroy over $20,000,000 worth of timber every year and kill the reproduction of thousands of acres of forest lands. Indications are that the supply of pulp wood timber will be exhausted in twenty years. In New York alone the supply will be gone in ten years. Ten years ago the United States produced enough for its entire newsprint and now it imports two-thirds of it. Only one-third of the newspapers issued in 1919 were printed on the product of the American forests.

Publicity and Education Necessary

Now, to overcome some of the things that are confronting and have confronted us as to the causes of the depletion of our forests is the work which a section of this kind can do, if it is properly handled, and, as I said in the beginning, it is largely a matter of education. In order to remedy some of these troubles, one of the first things to have is a well-defined policy of reforestation. This should be studied and it is a policy which your Forestry Committee will advocate and present to the states which are looking forward to legislation in forestry matters. That, we believe, is a practical way in which to handle it. The trouble with many policies of this kind and with our Conservation Committees is their political organizations. I have criticized our Committees in New York state many times because they are looking at the problems from a political standpoint rather than from the practical. They have not been willing to accept the views of practical men.

It has been hard work for some of us to make the people who are in a position to administer the affairs of our forest lands believe we are talking to them unselfishly. I have wished many a time that I had what little I know about forests without having any interest in forests whatever, then possibly I might interest them and they would not think I had some ulterior motive in talking to them. In our state, organizations down in the Adirondacks have controlled it largely and they go out broadcast and tell them that we are simply destroyers of forests and at the same time they themselves do nothing to help make our forests reproductive, or see that the lumbering operations are carried on in a way to perpetuate the forests or assist us in having our constitution amended so that the matured, dying and decayed crops can be utilized in the interest of the people of the state of New York.

I believe that the government should assist the private owners in reforesting lands. A forest crop is so long in growing that it is beyond our generation before we have a matured crop. If handled in the right way, our forests would yield a large revenue to the state—the largest revenue that could yield from any of our natural resources. We need more publicity and more education to get people to a point where they can see these things as we see them. Your Woodlands Sec-

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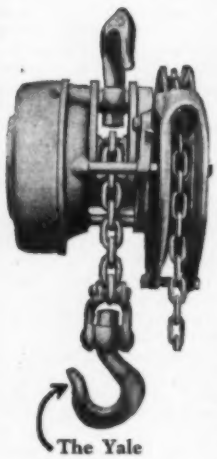

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SPUR-GEARED BLOCK

tion here can do a great deal in the way of publicity through its members in the Chambers of Commerce and other organizations you may have in your communities, and get them all interested.

I look back to the days of the little red schoolhouse where they had Arbor Days and they would go out and teach the children how to plant trees. We are not doing enough of that now, if we would have timber here for our children and our children's children.

One of the things which I think a section of this kind can do is to show us where we can save many of the wastes of our wood today. We all know that in a lumbering operation there is a great deal of waste. We have never thought of it because we have been able to use that part which we could use and make a profit, but we can all remember when we used to go into the woods some fifteen, eighteen or twenty years ago, and cut the hemlock trees for the bark and leave the trees to rot on the ground. In fact, one of the first things I did when I came with the company I am now with was to go up into our woods and pick up the logs of the trees they had cut ten and twelve years before for the bark and put them into paper. Perhaps they didn't make quite as good paper, but the paper was sold and I was conserving our wood supply.

An organization of a Woodlands Section can do a great deal, because there is nothing more vital to our industry than wood. Dr. Baker will outline the work in good shape, and he will send you pamphlets and circulars which you should read and then give him your opinion and criticisms, and I believe a great good will be done that will be of lasting benefit to our industry and to those who are to come after us in having forests left for them.

Why a Woodlands Section?

By A. L. DAWE

(*Canadian Pulp and Paper Association*)

Mr. A. L. Dawe (Canadian Pulp and Paper Association): Mr. Chairman and Gentlemen: In 1916 Mr. Carl Riordon introduced a resolution at the annual meeting reading as follows:

"Resolved, That there should be promoted a new section in this Association somewhat similar to the Technical Section to deal with the whole question of the production of wood for the making of pulp and paper."

It was found impossible to take any active steps in this matter until late in 1917, at which time a meeting was held in Montreal at which were represented most of the prominent pulp and paper companies, and at this time Mr. Riordon outlined his views in bringing the men together who were responsible for the production of the most vital raw material in the pulp and paper business.

Mr. Ellwood Wilson also said in part:

"The cost of cutting is increasing. Lumbering operations are now back so far that the hauls are very long. We are using the same methods that were employed 25 and 50 years ago, and new machines such as gasoline log haulers, cutting machines, etc., have not been introduced, as they should have been if the ingenuity used in the mills had been applied to the woods end."

Mr. Wilson also said:

"We must use the material we have to the best advantage. This involves the lumbering and utilization of the wood that will not float. The forest is reverting to hardwoods wherever they will grow, which will absolutely shut out and prevent the growth of a future supply of conifers unless we find means of getting the hardwoods out and using them so as to give the conifers a chance."

At this meeting also spoke Mr. A. B. Recknagel, the head forester to the Empire State Forest Products Association. In his talk Mr. Recknagel outlined what he had to contend with on taking up his work in connection with the Association. How it was necessary to make an inventory of land to find out what character of land was owned by the members. How it was necessary next to make an inventory of developments showing the character of improvements, the annual consumption in raw material, the output of finished product, the number of men employed, water power developed and similar data. In the course of his remarks, Mr. Recknagel emphasized the fact that the Adirondacks' most pressing problem is that of utilizing hard woods and that they had inaugurated a hard wood utilization study that is aiming to bring together suggestions for improvement in utilizaton and a study of wider markets for hard woods.

Another topic on which Mr. Recknagel spoke at some length was the subject of legislation, publicity and education. To use his words:

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Any width, to handle any weight paper from tissue to cardboard.

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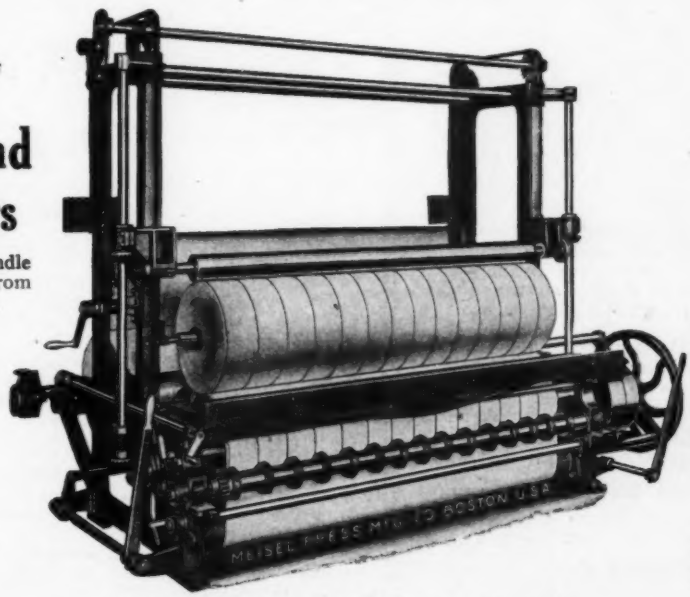

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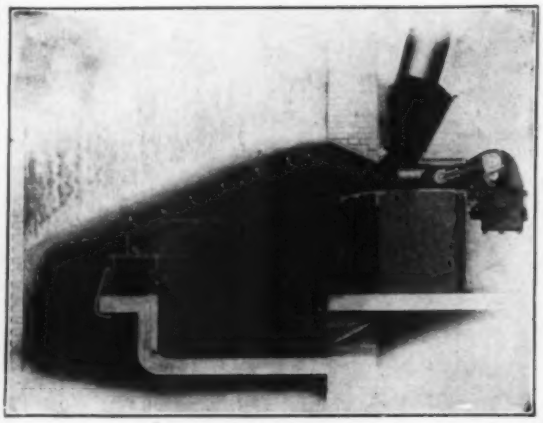

Cross-section through stoker, showing automatic operation

No device has shown itself better adapted to burn any available coal than the

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Low grade coals—those high in ash—in sulphur and clinker-forming qualities—can be handled successfully for the following reasons:

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"Nine-tenths of the problem is to educate the public to a realization that lumbermen are not vandals, thieves and pirates, but a necessary part of the economic machine. The old saying, 'Woodman spare that tree,' must give place to 'Woodman use that tree' and that the public must learn that forests do not improve by disuse any more than a man's muscles grow stronger in idleness."

Following the inauguration meeting, the first general meeting of the Woodlands Section was held in February of 1918, at which some very excellent papers were read by prominent men among the paper manufacturers, and which was followed by a general discussion which was entered into by most of those present.

Papers were also read on the use of tractors and other machinery, and it was felt that the first meeting was a very good start.

A meeting was held in the fall of the same year which was very much more widely attended and at which a great deal of valuable work was done by way of pledging co-operation with the government on investigations into destruction of trees by insects and fungus. Resolutions pledging the support of the Section to Commission of Conservation and the appointment of special committees to look into the matter of hard wood and standing committees on improvements and logging methods.

Further meetings were held in the beginning of 1919, and a fall meeting was held later at the Government Nurseries, at which time a general discussion on the work of the Forestry Department of the Province occupied a great deal of the time. Visits were also paid to the nurseries at nearby mills.

This was followed by the fourth annual meeting of the Woodlands Section at the beginning of this year, at which a detailed report was made regarding improvements in logging conditions and a series of very interesting papers, including one on the use of hydroplanes in protecting and surveying forests, were read.

In order to hold our members together we found it advisable to draw up a set of by-laws to govern the conduct of such section, copies of which I have pleasure in presenting to you for your attention.

It is, I think, quite desirable that Canada and the United States should work closely together in our woodlands problems. They are the same on both sides of the line, and we, on our side, would welcome the opportunity of co-operation between the two sections, even as we have had the privilege of working with the Technical Association of your industry. This co-operation has enabled us to bring out what will eventually be one of the most complete text books of any industry that has yet been published, and the accomplishment of these text books will be a direct tribute to a great deal of unselfish work on the part of mill owners and technical men on both sides of the border.

Woodlands Section of Canadian Pulp and Paper Association

BY-LAWS

ARTICLE 1

Name

This organization shall be called "Woodlands Section of the Canadian Pulp and Paper Association."

ARTICLE 2

Objects

The objects of the section shall be to stimulate interest in more economical and efficient methods of production and utilization of raw materials for pulp, paper and lumber industries; and to provide means for the interchange of ideas amongst its members, and to encourage investigation of woodlands problems.

ARTICLE 3

Membership

There shall be two classes of members: (1) Members—entitled to vote; (2) Associate Members—not entitled to vote.

1. Qualification for Members.—Any person who occupies or has occupied an executive woodlands position in the pulp, paper and lumber industry; anyone occupying a subordinate position in the pulp and paper industry who has had a satisfactory technical education; anyone who, though not having had a technical education, has special qualifications and experience.

2. Qualifications for Associate Member.—Any person who will support and assist the aims of the Woodlands Section, and who, by virtue of his qualifications, is likely to further the work of the section. These members may attend all official meetings of the section and have the right to take part in discussion.

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Note 1.—Any associate member, who, in the opinion of the council, satisfies the requirements of Class 1, may become a voting member.

ARTICLE 4
Election of Members

Each candidate for membership shall be proposed and seconded by members of the Woodlands Section, a majority of whose votes shall be necessary for election. The council shall also decide as to which class of membership the candidate is entitled.

ARTICLE 5
Dues

The annual dues for voting members shall be $3, and the annual dues for associate members $2, payable at the beginning of the calendar year. A member who has not paid at the end of the year is suspended.

ARTICLE 6
Officers and Council

The officers shall be a chairman and a vice-chairman, elected for one year by the members of the Woodlands Section at the annual meeting; a secretary-treasurer, who shall be the regular secretary of the Canadian Pulp and Paper Association.

The chairman and vice-chairman, with three councillors elected from the Woodlands Section, shall constitute the council of the Woodlands Section. The present council shall serve for one year, at the end of which time three councillors (in addition to chairman and vice-chairman) shall be elected as follows: One to retire at the end of one year, one to retire at the end of two years, one to retire at the end of three years, and thereafter one to retire every year, and one to be elected in his place to serve for three years. Retiring members of the council (other than chairman and vice-chairman) are not eligible to re-election as councillors for one year, although they shall be eligible for the office of chairman or vice-chairman.

The chairman, vice-chairman and secretary-treasurer shall perform the usual duties of these offices. The council as a whole shall pass on membership, attend to business between meetings and have general charge and control of the affairs of the Woodlands Section.

ARTICLE 7
Meetings

The Woodlands Section shall hold at least two meetings annually, if possible. The annual meeting for the election of officers shall be held at the time of the annual meeting of the Canadian Pulp and Paper Association. Two additional meetings may be held as determined by the council. Upon the invitation of a member of the council, non-members may be admitted to the meetings of the Woodlands Section. Meetings are to be called in writing, and every member is to receive due notice of any meeting, with a programme of what is to take place.

The proceedings of the Woodlands Section, upon the approval of the council, may be inserted in the Official Journal of the section.

ARTICLE 8
Amendments

The constitution may be amended by the members present at any regular meeting of the association by a two-thirds vote of the members present, provided that such amendment shall be submitted to the members in a printed or written notice at least thirty days before such meeting.

In our Technical Section we have been very happy in having the entire co-operation of American organizations. This co-operation has enabled us to bring out what will eventually be one of the most complete text books of any industry that has yet been published, and I feel it is going to be of help to the industry.

Mr. White, our general chairman, asked me to extend a very cordial invitation to any American members who would care to attend future meetings of our Woodlands Section.

What the Forest Products Laboratory Can Do for the Paper Manufacturers

By Otto Kress

(In Charge, Section of Pulp and Paper, F. P. L.)

Wood, under present American economic conditions, is the only logical raw material for pulp manufacture. The various crop fibres which are frequently suggested as substitutes for pulp wood, such as cotton stalks, corn stalks, sugar cane bagasse, the various straws, etc., have from a pulping standpoint the following disadvantages.

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is slitting and rewinding the product, and it could handle

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AS GOOD AS THE CHIPPER

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A REMARKABLE PERFORMER
IT DOES WHAT NO OTHER SHREDDER CAN DO

The Carthage Wood Washer
KEEPS DIRT OUT OF YOUR SHEET

The Carthage Ball Bearing Straightway Blow Valve
IT IS VERY DURABLE IT IS EASY TO HANDLE

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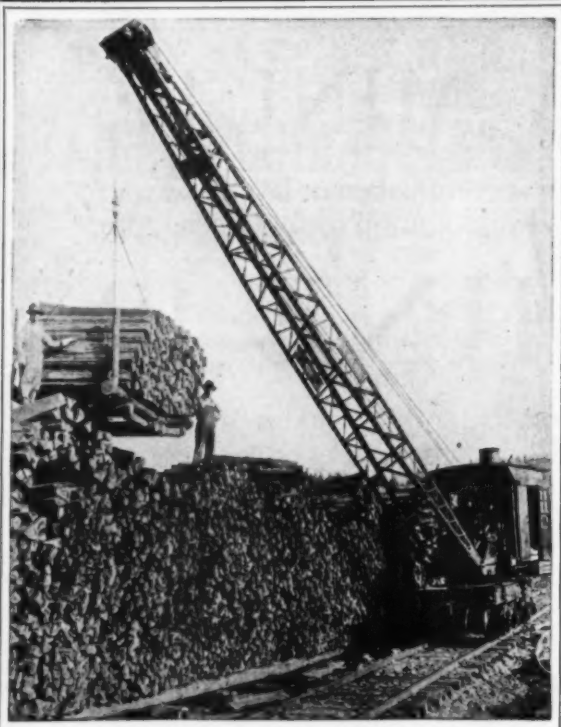

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Branch Offices in New York, Pittsburgh, Chicago and San Francisco.

1. These fibres represent seasonal crops of a very bulky nature, thereby requiring large storage facilities to enable the pulp mill to operate throughout the year.

2. These plant fibres contain either a large percentage of pith or in the case of straws a high percentage of silicious material which consumes excessive cooking chemical and gives low yields of pulp. Further, in view of the bulkiness of the plant fibres the digester charge is reduced, thereby reducing the yield of pulp per cook.

Certain of the plant fibres, such as cotton hull fibres and second cut cotton linters and possibly flax tow, can be used in large tonnage for the production of certain papers, as for these fibres the cost of treatment will be relatively low in comparison with the quality and value of the stock.

In Europe plant fibres, such as esparto, the straws, etc., are largely used for pulp purposes, but American conditions are such that wood has and probably will continue to be the basic raw material for the paper industry so that plant fibres offer no immediate remedy for the threatened shortage of pulp wood.

The Forest Products Laboratory is a Federal research institution established by the Forest Service in cooperation with the University of Wisconsin, at Madison, Wisconsin, to study the best means of utilizing our forests and forest products. The Section of Pulp and Paper is completely equipped with semi-commercial apparatus for the pulping of all woods by the soda, sulphate and sulphite processes, and with an experimental paper machine for the conversion of the pulp to paper. A study has been made of practically all the possible American woods to determine their suitability for pulp and paper production. According to the latest statistics on pulp wood consumption, the four important pulp woods, spruce, hemlock, balsam, and aspen, comprised 83.1 per cent of the total wood consumption. By a careful study of the best means of reducing woods, thought in the past, to be unsuitable for pulping purposes it has been found that several such species can be used for pulping thereby increasing our available supply of pulp wood.

As a case in point, the laboratory is attempting to pulp the various species of Southern pine by a modified sulphate process in order to produce a stock that can be bleached with a reasonable bleach consumption, and semi-commercial experimental work indicates that this can be accomplished. If this is proved by further laboratory work and finally by mill scale trials, it opens up the possibility of utilizing Southern pines and gum woods, of which large stands are available in the South, for book paper production. By Southern pines we have reference to the quick growing second growth pines, such as loblolly, pitch, scrub, etc., rather than the true longleaf or shortleaf pines, which are rapidly being cut out in the South.

There is no need of dwelling on the coming pulp wood shortage in the East and the effect of the ever increasing scarcity and shortage of pulp wood on the established Eastern mills. The pulp wood supply of the future in the United States lies in the South in the form of the various Southern pines and gums and in the Northwest where are found many species suitable for all kinds of pulp production. Large tracts of timber have been set aside in the West by the Federal Government to be administered and used under the direction of the Forest Service.

These National Forests, of which there are some 150, comprise 156,000,000 acres, which contain about one-fifth of the standing timber of the United States. This timber is subject to purchase under certain specified conditions of cutting. In sales involving large initial investments it is the policy of the Government to include in its sale sufficient timber to justify the investment. The Government stands the expense of surveying, mapping and appraising the tracts applied for and the appraisals aim to set a stumpage price which will allow the purchaser a reasonable return upon the operation. Government contracts do not require that the timber be paid for as a whole. They permit payment to be made in specified deposits from time to time as the timber is cut, thus relieving the operator from having much money tied up in stumpage. He is likewise relieved from taxes and the expense of fire protection, except in cases of emergency. One of the functions of the laboratory is to obtain detailed information covering the value and use of these Western woods, many of which are not being pulped at the present time.

The pulp mill industry, unlike the sawmill industry, represents a very heavy investment so that on depletion of the surrounding timber supply, pulp wood has to be brought to the mill from ever increasing distances and at increased costs. While the entire supply of the Eastern pulp wood has been very sadly depleted, considerable saving can be effected by proper technical control, and it is along this line that the Forest Products Laboratory can be of the greatest assistance.

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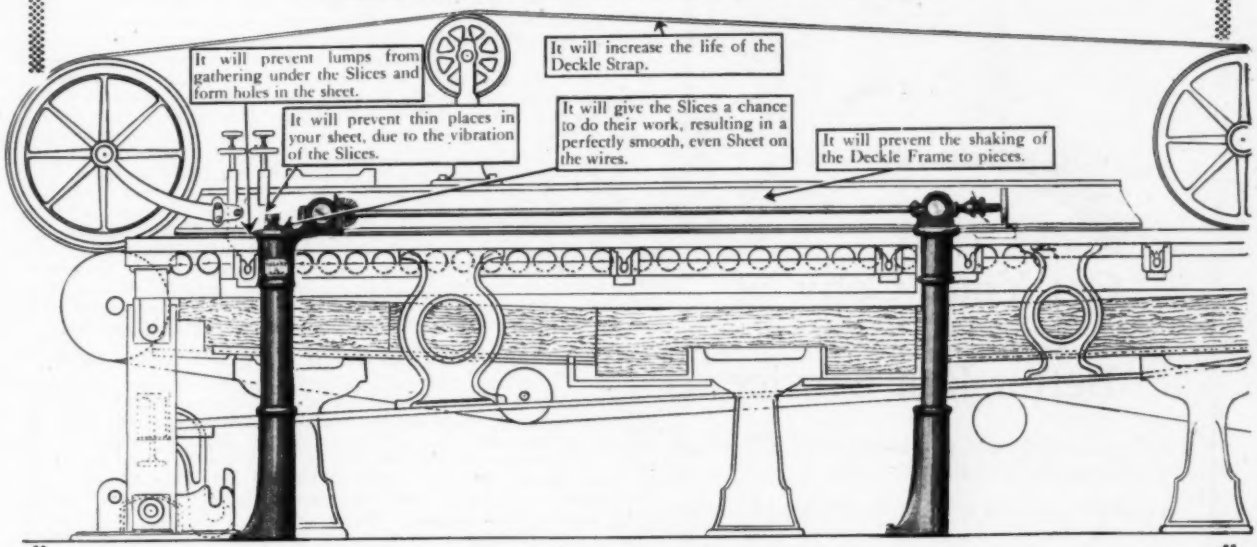
It will prevent lumps from gathering under the Slices and form holes in the sheet.
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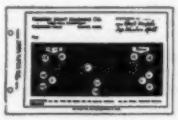

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A copy is yours for the asking. Just tell us to send you Booklet Q-1.

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The following are a few of the problems that the laboratory is studying, but in the active prosecution of which they are hampered by a lack of funds.

Causes and Prevention of Possible Wood and Wood Pulp Infection and Decay

In view of the ever increasing cost of wood, the pulp and paper industry in competition with the lumber and other wood using industries must largely purchase and use the culls and inferior stock not suitable for other purposes. This means that the pulp mill will receive in the future an increasing percentage of partly decayed wood which on storage, unless precautions are taken, will rapidly deteriorate. The laboratory in conjunction with a number of interested mills that are financing the work, has been studying this project for a little over a year, and the results indicate that there is an appalling loss from decay of ground wood pulp and of wood in storage. For example, a recent mill scale grinder run on partly infected mill run spruce showed a decrease of 390 lbs. of ground wood pulp per cord of infected wood in comparison with the yield per cord of sound wood. Equivalent losses are experienced in the chemical pulping of partly infected woods. Time does not permit to go into details but by proper storage it appears as though the bulk of this loss could be prevented.

The Purchase and Use of Wood on a Weight Basis

The present method of purchase and use of pulp wood on an indefinite cord or volume basis has certain decided drawbacks. Recent mill scale studies conducted by the laboratory in conjunction with the Newsprint Service Bureau resulted in the development of suitable means for the rapidly and accurately sampling of wood delivered to the mills in cars. The purchase and use of wood on a weight basis would have the following advantages.

1. Eliminate the uncertainty of the purchase and use of wood on the present indefinite cord or volume basis.
2. As wood during decay suffers no change in volume but does decrease decidedly in weight, the purchase and use of wood on a weight basis would automatically allow for the percentage of rot in the wood. The present method of attempting to scale out rot according to our observations is decidedly inaccurate.
3. The purchase and use of wood on a weight basis would place the mill cost accounting system on a logical basis between wood as the raw material which is now bought on a volume basis, and pulp and paper, the finished product, which is sold on a weight basis. This would also tend to avoid over and under runs on the periodical inventory of the wood supply.

The Chipping and Baling of Pulp Wood

Some work has been done on the chipping, drying and baling of pulp woods, which indicates that additional study might demonstrate the feasibility of this project for supplying mills with wood in baled chip form shipped from such distances as would not permit the shipping of round wood. Aside from the possibility of supplying the mill with wood from a larger radius the use of dry chips with the elimination of the wood storage and its subsequent barking and chipping offers decided advantages.

The Use of Wood Waste

The use of mill waste, such as slabs and edgings, is steadily decreasing, caused probably by the mechanical difficulties experienced in the barking and chipping of such wood. For example, in 1918, slabs and other mill waste comprised 154,603 cords, or 2.9 per cent of the total wood consumed, while in 1909 such waste amounted to 248,977, or 6.2 per cent of the total wood used. A study should be made of the best means of mechanically barking and chipping of mill waste in order to utilize the same for pulp manufacture.

The above mentioned problems are sufficient to indicate the field of work that the Forest Products Laboratory attempts to study. Through the proper cooperation between the industry and the laboratory a considerable saving and conservation of wood might be made. It is a peculiar but true condition that the industry pays far more attention to the purchase of the less important raw materials, such as sulphur, coal, colors, alum, size, etc., than to wood, which is the basic raw material of the wood pulp industry.

Adolph Helmus, a pioneer paper box manufacturer of New York City and widely known among paper and box board dealers as "Pop" Helmus, died at his home on Main avenue, Douglaston, Long Island, on November 26, aged 71 years. Mr. Helmus was president of the Paper Box Manufacturers' Association of the Eastern States.

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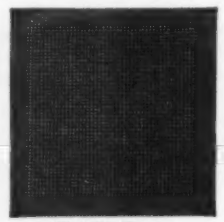
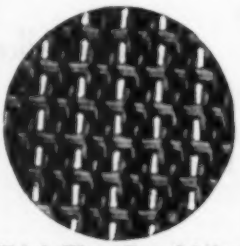


Triple Warp Fourdrinier Wire

TYLER TYLER



Triple Warp Fourdrinier Wire, Magnified Section

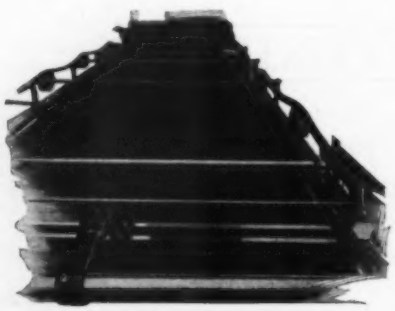
Triple Warp Fourdrinier Wires

The Tyler Triple Warp Fourdrinier Wires are made from phosphor bronze wire and are used for making finer grades of light weight paper, such as carbon, cigarette, high grade tissue, India and Bible papers, and other specialties.

As illustrated above, these wires are woven with a triple warp and a single shoot wire.

The triple warp wires can be woven to fit any paper-making machine, but are generally used on the smaller machines.

Prompt deliveries can be made on all meshes of Tyler Fourdrinier, Cylinder and Washer Wires. In many instances shipment can be made from stock, including the Tyler Special Wires and the regular No. 60, 65, 70, 75 and 80 Wires.



The W. S. Tyler Company
Cleveland, Ohio

Manufacturers of Fourdrinier Wires, Cylinder Faces, Washer Wires, Corduroy Cloth, Backing Wires

National Safety Council's Automobile Course

The eight thousand industrial organizations, trade associations, and governmental agencies comprising the National Safety Council have just undertaken the biggest job ever attempted by the Council during the eight years of its existence—to teach the fundamentals of safe driving and motor vehicle maintenance to every motor truck and passenger car driver employed in industry, whether or not his employer is a member of the Council.

The purpose of the undertaking is threefold:

First, to reduce so far as possible the number of fatalities resulting from automobile accidents which now approximate 15,000 a year—one person is killed by an automobile every thirty-five minutes.

Second, to save for industry and the public at large the millions of dollars lost each year through property damage resulting from automobile accidents—this loss amounting to $500,000 a year in a city of little more than half a million population.

Third, to save for industry some of the many millions of dollars now paid out annually for compensation, medical attention, lost time, and damage for personal injuries resulting from automobile accidents.

The National Safety Council through its forty local councils has for several years carried on a campaign against joywalking and other forms of carelessness on the part of pedestrians. But it has discovered in this campaign that while the pedestrian is responsible for a large percentage of accidents, at least an equal percentage of automobile accidents are due to ignorance of the safe methods of motor car driving or maintenance on the part of the drivers of commercial vehicles.

The Council, with the aid of automobile manufacturers automobile driving instructors, automobile traffic managers, repair men, and the representatives of practically every industry interested in any phase of the automobile accident problem, conducted a nine months' study of the causes of accidents and means of eradicating those causes. This study has just been completed and the findings published by the Council in the form of a set of twelve Safety Bulletins and Lessons for Automobile Drivers.

With the view of getting a set of these lessons into the hands of every motor truck driver, every taxicab driver, every commercial passenger car driver, in the country, the Executive Committee for the first time has waived the rule which in the past has confined the distribution of National Safety Council research reports to the members of the Council.

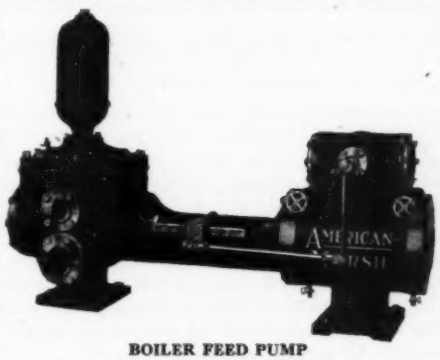
The lessons, covering every phase of motor vehicle operation and maintenance which enters into the accident problem, will be distributed by the National Council through its local councils, through automobile schools, automobile clubs, automobile insurance companies, and through every other means which presents itself.

For the Council feels that if it succeeds in making a set of the lessons available to every chauffeur and truck driver in the country it will mean annually a saving of thousands of lives, a saving of millions of dollars to industry, and the speeding up of automobile and motor truck traffic through the elimination of lost time due to accidents which now amounts to thousands of hours daily in every big industrial center.

"It is inconceivable," says C. W. Price, General Manager of the National Safety Council, "that any man into whose hands a set of these lessons is placed should not get, at the very least, one idea which would at some time prevent one accident.

"Never in the history of the National Safety Council," Mr. Price said, "has there come such persistent demand from our members for help in solving any problem as that for help in controlling the automobile hazard.

AMERICAN-MARSH PUMPS



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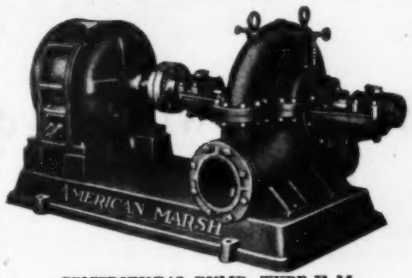

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American-Marsh Centrifugal Pumps are made in both the single and double suction, solid and split case patterns. Especially designed for paper mill requirements.

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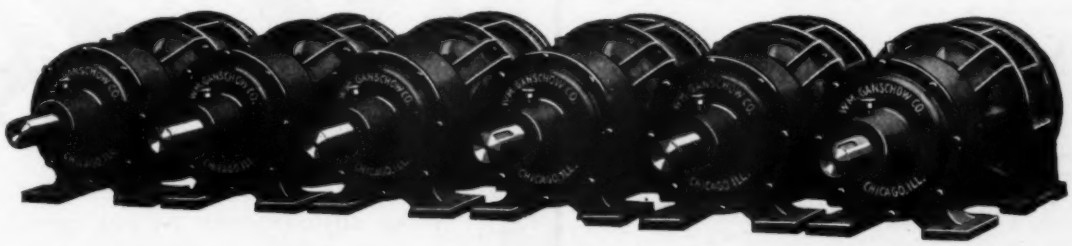

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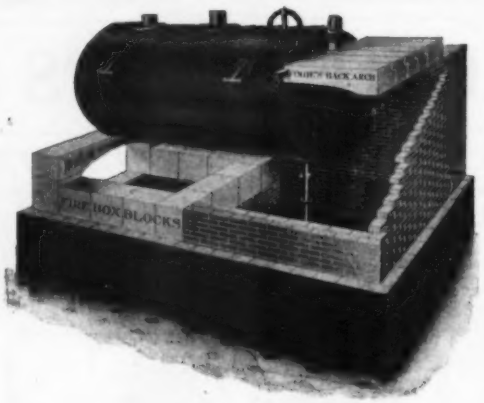

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Gentlemen:

Would be glad to receive your catalogue on boiler settings. May be particularly interested in .....

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"A few thousand automobiles in 1906—increasing to seven and one-half million in 1919—with a corresponding increase in deaths from 374 in 1906 to 10,000 in 1919—has suddenly thrust upon the people of the United States a problem more alarming and more far reaching than any other in the history of accident prevention.

"Two striking facts reveal the seriousness of this hazard:

"First, one-half as many people were killed by this one machine alone in 1919 in the United States as in all the industries, railroads and mines combined.

"Second, probably not more than one-third of our people are exposed to industrial hazards, while practically every man, woman and child who walks out of his front door is exposed to this new and giant hazard which stalks down our streets and highways.

"Out of the serious study which the officers and staff of the Council have given this great problem has come the conviction that one of the first things which must be done towards a permanent solution is to develop standard instructions covering both the mechanical side of automobile safety and the safe operation of motor vehicles.

"If we are to train drivers of automobiles and trucks we must first furnish them with specific instructions covering the inspection, repair, and operation of their machines. Thousands of accidents have happened because drivers did not know their machines. Years of experience are required before an engineer is allowed to run a locomotive, yet we allow a boy of eighteen or twenty years, with only a few superficial instructions, to drive a monster truck down our streets, threatening many more lives than any locomotive which is confined to two steel rails."

As to the proportion of responsibility of the commercial truck in the annual slaughter caused by gasoline propelled vehicles, no national figures are available, but in the two largest cities of the United States figures have been com-

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piled which give a clew. The report of the Commissioner of Health of New York City shows that of a total of 638 automobile fatalities in the year 1918, trucks were responsible for 171, or more than one-fourth. The report of the Coroner of Cook County, Ill., of which the city of Chicago constitutes practically the whole, shows that in 1918, of a total of 369 automobile fatalities, trucks were responsible for 144, and in 1919 of a total of 416 automobile fatalities trucks were responsible for 133.

The lessons are printed on sheets 8½ by 11 inches. On the reverse side of each is a safety bulletin illustrating some specific automobile hazard.

The accompanying illustration is a copy of the first bulletin issued and Lesson 1, which is printed on the reverse side, deals with Brakes and Braking. This is one of the most important elements in the automobile accident problem. The lesson tells how to keep brakes in condition such that they will be reliable and certain of action.

Nine of the lessons are devoted to motor vehicle maintenance, the rest to safe operation.

Measurement of Pulpwood

A report made to the Committee on Uniform Cost Keeping of the News Print Service Bureau on November 8, 1920, by Dr. Otto Kress, of the Forest Products Laboratory, Madison, Wisconsin, and Geo. D. Bearce, Engineer for the Bureau upon "The Measurement of Pulpwood and the Determination of Yields Therefrom," represents the results of some important studies and mill tests made during the past six months.

The report contains in part the following: "It is common knowledge that the cause for all uncertainty regarding the volume of wood used in a given time and the consequent uncertainty in the determination of pulp production figures, is because wood has been used on a volumetric basis with the cord as the unit of measurement. The solution of the problem is to determine not the cubic or cord measurement of the wood but the actual wood content. If this can be determined there is then established a definite relation between the wood used and the pulp produced therefrom.

"An investigation has therefore been carried on by the Bureau for the last six months in co-operation with the Forest Products Laboratory, having the following main objects in view:—

1. To establish the relation between the volume and the weight of a unit quantity of wood and the weight of the pulp produced therefrom.
2. To determine accurate and practical methods of sampling wood for moisture.
3. To determine adequate methods of obtaining the measurement of slush pulp either by weight or by volume.
4. To study and recommend practical means of weighing wood delivered in large quantites to the mill under varying conditions.

"Extensive tests were made to obtain data under actual mill operating conditions upon the yield of groundwood and sulphite pulp that can be obtained from a given volume or weight of wood used and special attention was given to the amount of decay of the wood. The variation in moisture content of pulpwood under varying conditions of storage was also thoroughly studied.

"The results of the work have been submitted to, and approved by an advisory committee consisting of:

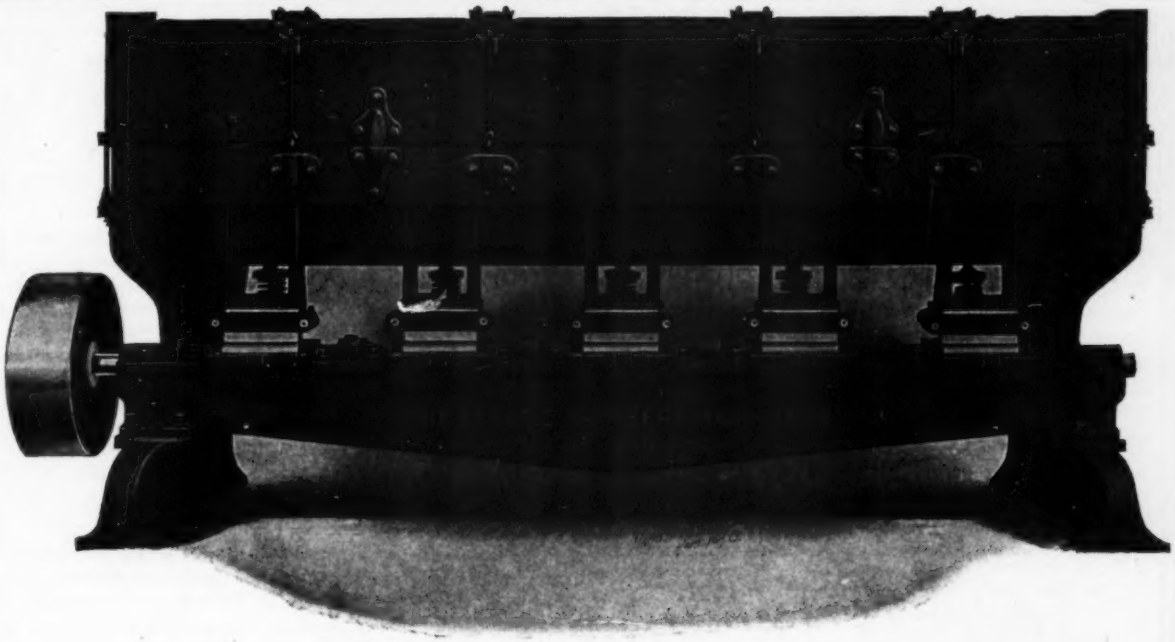
J. S. Bates, Technical Superintendent, Price Bros., Ltd.

E. A. Charlton, Superintendent Paper Mill, Brompton Pulp and Paper Co., Ltd.

C. F. Rhodes, Manager of Bureau of Tests, International Paper Co.

J. P. Riley, Manager of Woodlands Dept., International Paper Co.

L. H. Shipman, Assistant to the Manager, Spanish River Pulp & Paper Mills, Ltd.



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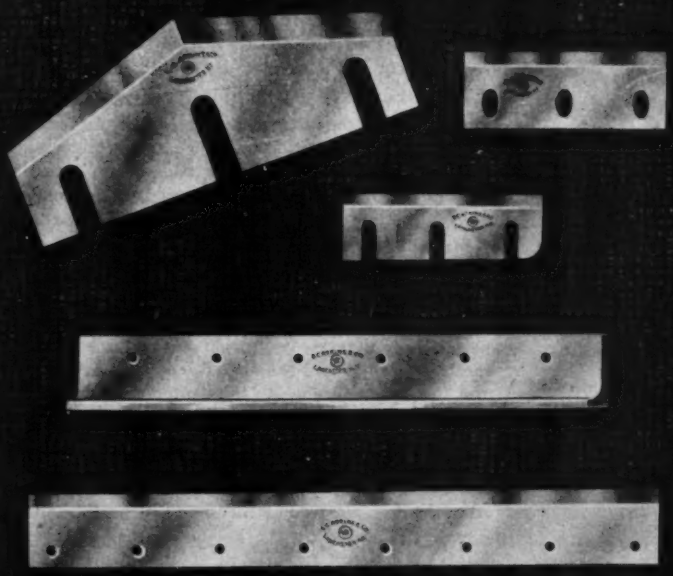

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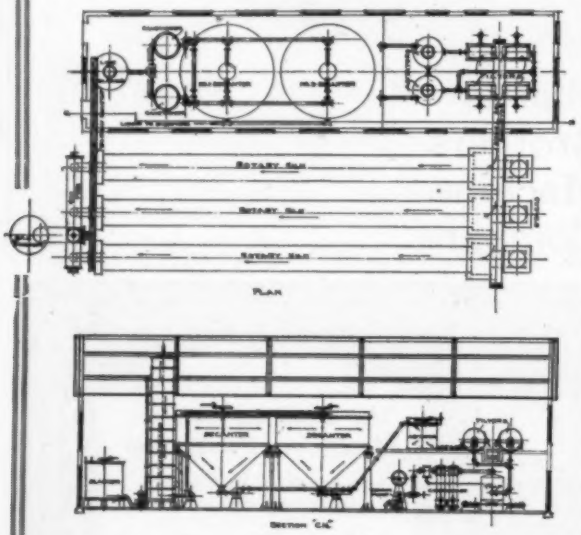
OUR apparatus is built for the specific purposes indicated in the above title. It is the work of our consulting engineer, who for nearly twenty-five years was general manager and chief designing engineer of one of the large alkali plants in this country. The apparatus has been in successful operation for some seven years, and is highly efficient, both as regards economy in the use of raw material, and saving in labor.

The complete plant which we furnish, consists, as indicated in the sketch, of a continuous causticizer, decanter, rotary filter, rotary kiln, gas producer, lime slaker and auxiliary apparatus such as vacuum pump, lime and liquor pumps and sludge agitator. All apparatus work continuously. The causticizer is heated with exhaust steam, and supplied continuously, by means of pumps, with calcium hydrate and sodium



carbonate in the proper proportions. The continuous discharge of caustic liquor and lime sludge is delivered by pumps to the decanters, the clear caustic drawn from the top and the mud from the bottom; delivered by pump direct to the sludge agitator from whence it flows to the filters. The dried filter cake is delivered by belt to rotary kilns fired with gas, from whence the recovered lime is returned to the slaker to be used again.

With good grade of lime, 90% of the sludge can be recovered. The alkali loss is with careful working, almost nil. All of the apparatus is of heavy construction, and specially designed for the work. The process being continuous the steam consumption is much less than that of the batch process, moreover the process does not require live steam, exhaust at 10 pounds pressure being ample to operate at maximum capacity.

Glamorgan Pipe & Foundry Co.

Lynchburg, Va., U. S. A.

"The present method of measuring pulpwood based on a cord piled 4' x 4' x 8' with a theoretical volume of 128 cubic feet is universally recognized as being extremely unsatisfactory. The volume in solid cubic content of a cord of wood piled 4' x 4' x 8' varies from 65 cubic feet to 95 cubic feet though under ordinary conditions the volume of the cord usually varies from 80 to 90 cubic feet. This is due to the variation in the diameter and length of the sticks of wood and the proportion of knots and crooks.

"Recently one of the larger newsprint mills determined by actual trial that a cord piled 4' x 4' x 8' which had been previously assumed to contain 95 solid cu. ft. of wood actually contained a fraction under 90 cu. ft. representing an error of 5.6%. Sound spruce averages 26 lbs. per solid cu. ft. of bone dry wood so there was a discrepancy of 130 lbs. of actual wood substances per cord. On a daily consumption of 100 cords this represents 13,000 lbs. of wood equivalent to 6,500 lbs. of sulphite pulp or 11,700 lbs. of groundwood pulp. Assuming $150.00 per ton for sulphite and $120.00 per ton for groundwood as being the present market price, this difference in calculation represents $480.00 per day for sulphite or $700.00 per day for groundwood.

"The investigation dealt extensively with the question of decay in wood. Recent studies by the Forest Products Laboratory at Madison, Wisconsin of the decay of wood show that there is an appalling loss to the industry from this cause. Such losses should be correctly determined and this cannot be done by the cord or volume measurement of pulpwood, which, while undergoing decay suffers no change in volume, but does decrease decidely in weight. Scalers attempt to estimate rot in wood but this is arbitrary and often incorrect.

"Examination of a number of shipments of infected spruce wood shipped to the laboratory for pulping purposes showed a maximum variation in comparison with sound wood of 5 pounds per cu. ft. of bone dry wood. Assuming the cord to consist of 90 solid cu. ft. this loss is equivalent to 450 lbs. of wood per cord. Assuming sound spruce wood to weigh 26 pounds per cubic foot or 2,340 pounds per cord, the loss of 450 pounds per cord represents a 19% loss on actual wood substance. It is unnecessary to show further the enormous loss this means to a mill using several hundred cords of wood daily.

"In order to measure wood in terms of its bone dry weight it is absolutely necessary to devise an adequate and practical method for determining the moisture. For this purpose 550 separate moisture determinations were made of the disc and boring methods.

"The disc method consists in cutting a cross sectional disc from a certain point in the log, weighing it wet, drying, and then weighing again, the difference in the two weights representing the moisture. This method is acknowledged to be theoretically correct but it is slow and costly. The more practical method was found to be, to bore a ¾" or larger hole from the circumference to the center or pith of the log. The shavings obtained by the borings were tested in the same way as the discs to determine the moisture. The boring method gives a bone dry weight averaging about 2% more than the disc method. This slight descrepancy can be allowed for in the computation of correct results. The time consumed in testing 4' wood by the boring method averaged about 30 minutes per car of 12 cords or about 2½ minutes per cord for the actual time of sampling.

"The tests were conducted at the following mills:

Nekoosa-Edwards Paper Co.—for 10 weeks on Sulphite.

International Paper Co., Hudson River Mill—for 1 week on Sulphite.

International Paper Co., Hilton Mill—15 days on Groundwood.

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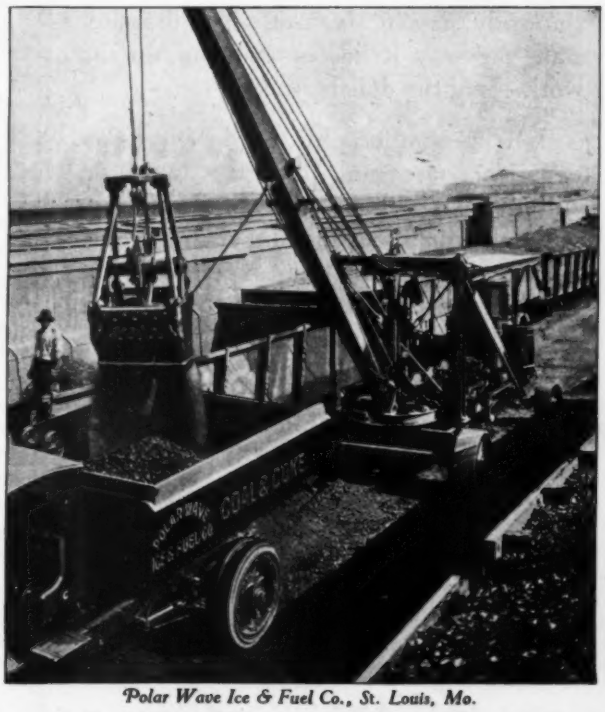

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"Owing to the length of the test at the Nekoosa-Edwards Plant we were able to obtain figures showing variations in production both per cord and per pound of wood used. The average yield of sulphite pulp per pound of bone dry wood after making an allowance for loss in barking of 13%, was 43.4%. This figure is comparable to the results obtained in experimental tests by the Forest Products Laboratory.

The test on sulphite pulp at the Palmer Falls Plant of the International Paper Company confirmed the results obtained at the Nekoosa-Edwards Plant, and the average yield for the entire test was 44.2% per pound of bone dry peeled wood used.

At the Milton Mill of the International Paper Co. the yield of groundwood for the four runs shows an average of 93.57% per lb. of bone dry wood. The maximum difference between the highest and lowest yields of the four runs was 3.45% per lb. of wood.

"In the use of wood on the weight basis, equipment is of vital importance. This is necessary in order that the methods used may be economical, practical and as nearly automatic as possible. Various scales and other measuring devices are now on the market, some of which are in use in the paper industry. It is probable that apparatus used in other industries can be adapted for use in pulp and paper mills and all of this equipment will be described in detail in the full report of the investigation. At this time, it will suffice to mention one type of scale, among many, which has been used for several years with reliable results in the weighing of chips on a continuously moving belt conveyor and simultaneously recording their weights.

"The cord method does not accurately determine the variation in solid cubic content and the loss due to decay cannot be accurately estimated by scaling. It has been demonstrated that wood can be accurately and quickly sampled for moisture content. This provides a definite basis of measurement and reduces to almost a negligible figure the inaccuracies unavoidable under the cord system. A weight basis is comparable to the present mill method of weighing coal, limestone, sulphur, alum and other raw materials which are of less cost and importance than the raw wood. Some of the advantages of using a weight basis for wood are:

1. A definite determination of the actual quantity of solid wood used in the mill, thereby entirely overcoming the difficulty at present experienced in the measurement of wood on the indefinite cord basis, thus eliminating overruns or shortages in wood inventories.

2. The weight basis eliminates the present uncertainty in attempting to scale out the proper percentage of rot in a specified quantity of wood, as wood does not change in volume during decay but suffers a direct loss in weight in proportion to the amount of rot present.

3. The use of wood on a weight basis makes it possible to definitely determine the quantity of pulp which can be produced from a given amount of wood, thereby eliminating the uncertainty of the cord or volumetric basis.

4. The use of wood on a weight basis would be of very material assistance in putting the Pulp and Paper Industry on a scientific basis comparable to other similar industries and would immediately result in closer technical and mill control.

5. Correct quantities can be obtained for cost accounting purposes by the establishment of a logical relation between the weight of wood which is the raw material and the weight of pulp and paper which represents the finished commodity.

6. It would be very advantageous to a company that buys wood in car load lots to purchase on the weight basis as it would be protected against buying rotten wood.

It should however be emphasized that this is entirely distinct from the advantages of weighing wood after its delivery to the mill."

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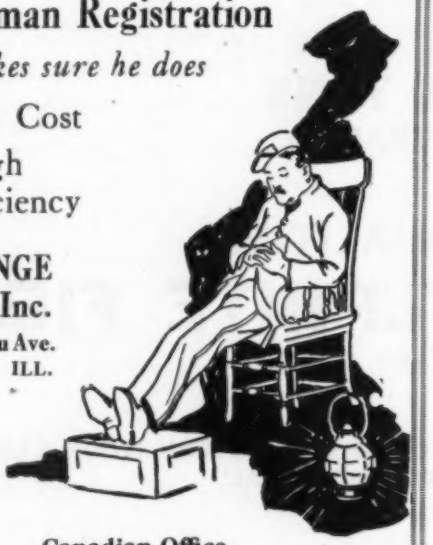

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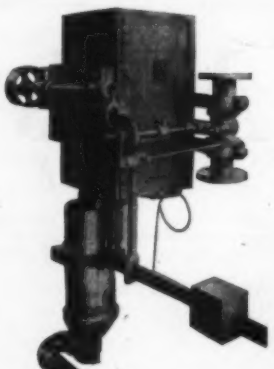

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While the final conclusions may seem somewhat revolutionary to many pulp and paper manufacturers, it is believed that they are entirely in the direction of sound progress and a better practice in the industry.

Notable forestry demonstration projects for 1921 under the supervision of the New York State College of Forestry at Syracuse are already under way, and more demonstrations are being added each month as part of the 1921 program. The policy of the college of educating the state through practical demonstration plantings will be continued next year on an even larger scale than last spring, when nineteen demonstration plantations were made in nine counties, with a total planting of 300,000 trees.

The Need for Technically Trained Men

"When a student completes college, even a technical school, he is not ready to accept great executive responsibility, but is a skilled apprentice, who must be tempered by actual business experience. American industry today, however, is calling more and more for this type of trained man, fitted by college sources to be developed by this experience into the highest type of professional executive. In no profession is this more true than in forestry."

This was the manner in which Dean Franklin Moon of the New York State College of Forestry at Syracuse pointed out the reasons why forestry is considered in New York to be a utilization problem, containing a large engineering factor. And he continued:

"We now see the need for men with technical education to distribute lumber. The demand for technically trained men in the industries is increasing. Providing for the future timber supply means not only increased production, but decreased waste in manufacture, and increased efficiency in distribution. Unless the industries drawing upon the forest for their raw product can manufacture and sell their product at a profit, we can not expect the practice of forestry by the private owner.

"In training men for the practice of forestry we must deal justly by both the student and the prospective employer. If the employer does not expect too much of the student, does not overload him with responsibilities for which college training has only prepared the way, the student alike must realize when he goes into the business world that his education has only begun with his four years in college. By this joint realization, the industries will be tremendously benefitted by the placing of technically trained men in all branches of the wood using industries."

The firm of Daniel M. Hicks, Inc., dealers in and importers of paper mill supplies of 200 Fifth avenue, New York, is this month celebrating its twenty-fifth anniversary. The business was started in December, 1895, by the late Daniel M. Hicks, who during the years he spent in the paper stock trade built up probably the widest circle of close friends in all branches of the paper industry that is enjoyed by any man in the business. Mr. Hicks was truly a pioneer in the paper stock trade, having spent upwards of 20 years in the business prior to founding his own firm. Since his death a year or so ago his three sons have been actively in charge of the business.

The West Virginia Pulp and Paper Company, a Delaware corporation with principal offices in New York City, has increased its capital stock from $20,000,000 to $80,000,000, according to a notice filed with the Secretary of State of Delaware at Dover.

Eric Corin, of Corin Bros., Inc., importers and exporters of wood pulp of 2 West Forty-seventh street, New York, sailed from New York on the steamer Drottingholm November 27 for Gothenburg, where he will assume charge of the company's branch office in that city.

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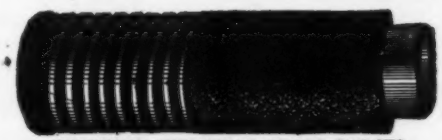

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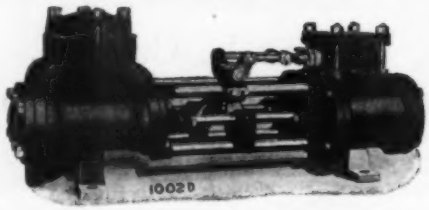

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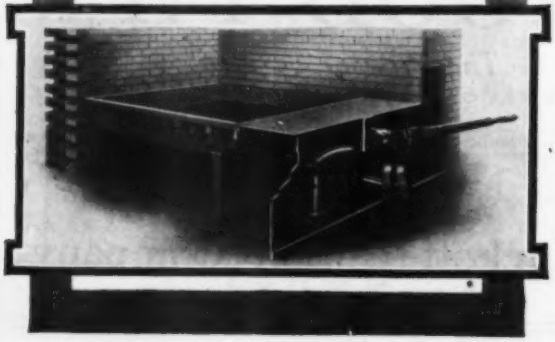


Kalamazoo Cost Convention

The second annual convention of the Kalamazoo Valley Division of the Cost Association of the Paper Industry was held at the Park American Hotel, on Monday, November 27, 1920.

An elaborate and instructive program included the following speakers: B. E. Hutchinson, Treasurer of the American Writing Paper Co., Holyoke, Mass.; T. J. Burke, Secretary and Treasurer of the Cost Association of the Paper Industry; Durward E. Burchell of Cambridge, Mass., and Earl G. Barr, of Chicago.

The subject of Mr. Hutchinson's address was "The Practical application of cost work to Management," and that of Mr. Burchell was "Accounting Control of Manufacturing."

Mr. Burke in a brief talk gave some valuable pointers in accounting derived from his long experience and Mr. Barr's address was illustrated by a number of charts and created considerable discussion.

Among those present were the following: Albert Milham; B. M. Silver; A. L. Loring; W. H. Oliver; M. B. McClellan; J. S. Carter; R. F. Carnell; C. L. Fenstermacher; C. H. Martin; L. E. Insing; Clair Crossley; G. W. Gilkey; James C. Handy; Earl Barr; Ralph Clark; Paul L. Haas; R. S. Mickey; D. E. Burchell; B. E. Hutchinson; Thomas J. Burke; Bernard Sherman; S. M. Clymer; Allan B. Millham; Peter Gideon; G. T. Ingling; G. T. Jubb; William Allan; T. S. Porter; W. B. Rapley; Ray H. Borst; Peter Bosker; Edwin H. Hacking; Harry F. Hummell; Richard Van Bochave; J. Platt Glezen; Paul L. Broesmale; Harold Westenhiser; Harry Bradford; George K. Ferguson; A. G. Rasch; Roy L. Strong; Jay F. Bachelder; H. A. Bardeen; L. W. Russell; L. N. Russell; Harry D. Barney; C. E. Spangler; R. C. Simpson; F. L. Brown; W. G. Duryce; R. H. Burnham.

The November meeting of the Michigan Division of the American Pulp and Paper Mill Superintendents' Association was held at the Park-American Hotel in Kalamazoo, November 24. The principal address was given by Benj. F. Soffee, of The Permutit Co., of New York, on water and water softening. A very enjoyable evening was spent by those in attendance.

Committees of T. A. P. P. I. at Work

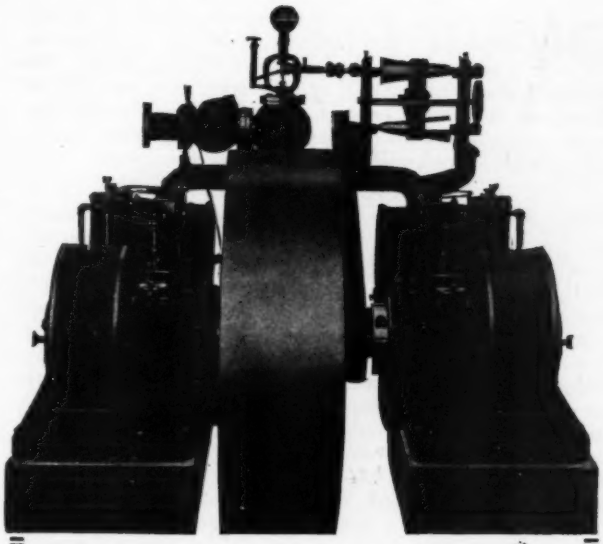
Nearly all of the standing committees of the Technical Association of the Pulp and Paper Industry are now fully organized and ready for active work.

Developments in Dyestuffs

The Dyestuffs Committee, under the direction of Dr. Otto Kress, of the Forest Products Laboratory, Madison, Wis., will have a report of unusual interest to make at the annual meeting following developments in the manufacture of dyestuffs for the paper and textile trades since the World War. The committee as finally constituted now consists of the following specialists in tinted papers and dyes: Dr. Otto Kress, chairman, Forest Products Laboratory, Madison, Wis.; Ross Campbell, American Writing Paper Company, Holyoke, Mass.; Charles C. Bright, Kimberly-Clark Company, Neenah, Wis.; Clarke Marion, Champion Coated Paper Company, Hamilton, Ohio; Kenneth T. King, E. I. du Pont de Nemours & Company, 1114 Tribune Building, Chicago, Ill.; C. C. Heritage, National Aniline & Chemical Company, Buffalo, N. Y.; Carl C. Schneider, Knowlton Brothers, Inc., Watertown, N. Y.

Investigations of Coating Materials

A new committee which was formed at the last annual meeting, is the Committee on Coated and Processed Papers, of which Clarke Marion, of the Champion Coated Paper Company, Hamilton, Ohio, is chairman. The committee is preparing specifications of actual tests on the influence of stock on the coating, the coating of paper being influenced to a greater or less extent by the character of the stock used. The



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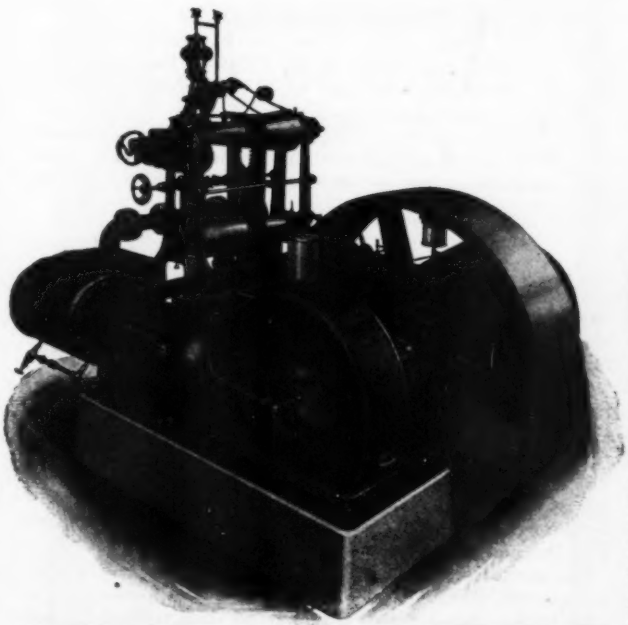

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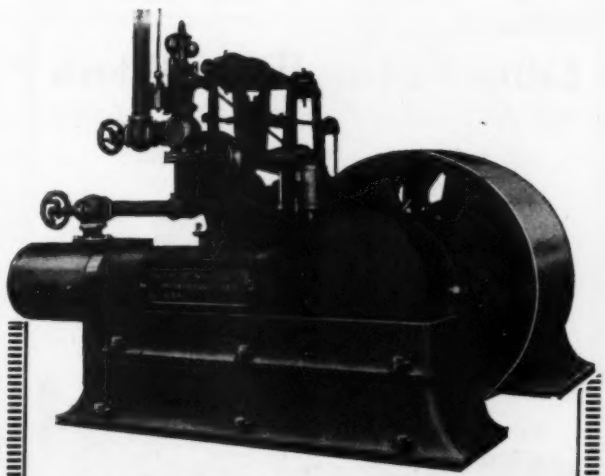

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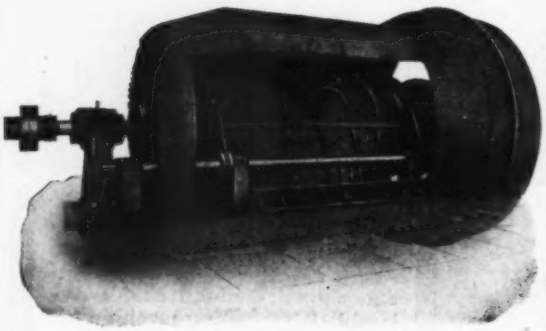

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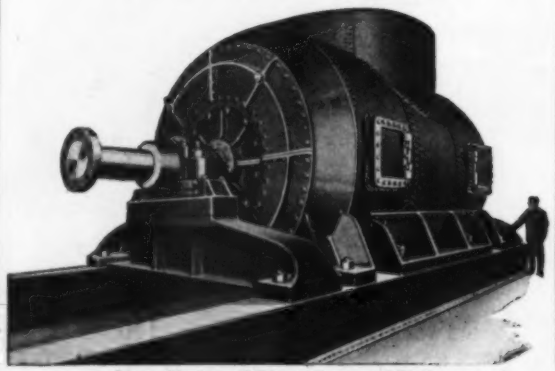

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body of the stock must be varied in accordance with the results that are looked for. Thus, a dull finished coating requires a different grade of stock from a highly finished sheet. The several ingredients entering into the stock also exert an influence on the finished product. The committee therefore decided to establish a set of specifications or standards for the different ingredients that compose the actual coatings.

Specifications for Casein

The coating of paper involves the general use of such materials as casein, starch, clay, blanc fixe, satin white, dyes, etc. The committee intends to concentrate its early work on the testing of casein and will endeavor to establish several simple tests and requirements to which a standard casein should conform. Among other aspects of the testing of casein, which the committee will consider, are its clay carrying capacity, and the process of manufacture, whether lactic, sulphuric, muriatic or natural soured, the percentage of fat, moisture and foreign substances. The Committee on Coated and Processed Papers is composed of the following members of the Technical Association of the Pulp and Paper Industry: Clarke Marion, chairman, Champion Coated Paper Company, Hamilton, Ohio; Norman Clark, Nashua Gummed and Coated Paper Company, Nashua, N. H.; Harold M. Holden, Falulah Paper Company, Fitchburg, Mass.; Edwin Sutermeister, S. D. Warren Company, Cumberland Mills, Me.; Kenneth T. King, E. I. du Pont de Nemours & Company, Inc., 1114 Tribune Building, Chicago, Ill.

Estimating Beater Furnish

Mr. Justus C. Sanburn, Chemist, Strathmore Paper Company, Mittineague, Mass., has been appointed by President Hatch chairman of a Committee on Beater Furnish, which will co-operate with a committee of the Cost Association in determining methods of estimating the quantities of materials added to the beater in the production of certain papers. Mr. Sanburn has accepted the appointment and is now studying the situation.

New Members

During the month of November, the Executive Committee of the Technical Association of the Pulp and Paper Industry has taken favorable action on applications for membership numbering two active and one junior.

The supply of Technical Association Papers Seriesii is now exhausted. A new volume is in preparation consisting of the papers and discussions at the Fall meeting of the association held at Saratoga Springs, N. Y., last September.

Geo. W. Sisson Returns Home

Geo. W. Sisson, President of the American Paper and Pulp Association, returned through Chicago recently from a trip to the Pacific Coast, where he went immediately after the Fall Convention, the week of November 8. While there he had the pleasure of judging some very fine cattle at an exposition and visited the mills of the Crown-Willamette Paper Co. and the Hawley Pulp and Paper Co. He stopped off at Chicago and was invited to attend the meeting where a $1,000,000,000 trade company was organized for financing American foreign trade, at which addresses were delivered by Herbert Hoover, E. N. Hurley and many other men prominent in American business life.

One sentence of Mr. Hoover's address brings out the importance of this move, when he said "It is vital to every workman in the United States that Europe shall recover her exchange, her production, her standard of living, or we shall be dragged down to European standard."

Mr. Sisson was fortunate indeed to arrive in Chicago just when such an important affair was being formulated.

Joseph H. Borden with A. W. P. Co.

Joseph A. Borden, formerly general secretary of the United Typothetae of America, has recently been appointed Director

The ELLIS AUTOMATIC TILTING STEAM TRAP

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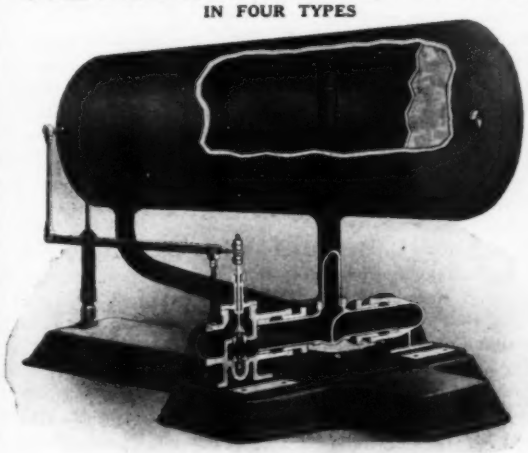

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Lifting Traps, Separating Traps
ESPECIALLY ADAPTED FOR PAPER MILL USES.

The best trap made to remove the steam condensation from paper machine dryers. Works on a new and improved principle different from any other trap on the market.

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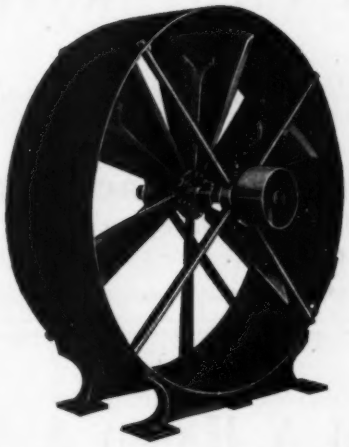

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We have been building fans for paper mills so long that we know exactly what the mills need, and build our fans to best suit the purposes. You need fans and should have those built by us.

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Davis Regulator—

As Certain As Gravity Because Gravity Controlled

The Davis Pressure Regulator in paper mills is positive in action because gravity controlled by weighted lever arm—no packing—no springs nor diaphragm to get out of order.

It reduces high pressure steam to the exact lower pressure at which auxiliary apparatus, such as steam beaters, slitters, cutters, etc., give greatest economy. Supplies uniform pressure regardless of fluctuations in boiler pressure.

The extensive line of Davis steam savers is described in a catalog full of steam-saving data valuable to the mill operator. Write the G. M. Davis Regulator Co., 414 Milwaukee Ave., Chicago.

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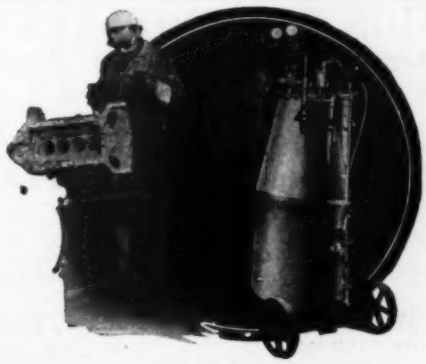
STEAM SAVERS SINCE 1875
SPECIALTIES



Break-Downs Come When You're Busiest

When the mill is operating under the strain of full, 24-hour capacity, break-downs are most common and most expensive. You can avoid many costly delays by equipping your welding outfit with an

Imperial
Automatic
ACETYLENE GENERATOR

Makes its own acetylene gas as needed, 2 to 4 cents cheaper per cubic foot than you can buy it. Always ready for immediate use. Pays for itself quickly in cost of gas and time saved. Write for illustrated catalog.

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Watermarking a Specialty

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Originators and Oldest Manufacturers
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(Best phosphorized Cast Metal)
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UNION BRONZE SCREWS for Screen Plates
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The Witham Screen Plate Fastener, Patented
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Ticonderoga Machine Works
TICONDEROGA, N. Y., U. S. A.
MANUFACTURERS OF
WARREN IMPROVED CALENDER DOCTORS
With Flexible Blades, Universal Adjustment and Control
(PATENTED)
WARREN IMPROVED PATENT DOUBLE DRUM WINDERS
Patent BALL VALVE Hydrant
Stock Circulating Systems *and*
other Paper Mill Specialties
SEND FOR OUR BULLETIN

of Service of the American Writing Paper Company of Holyoke, Massachusetts, manufacturers of Eagle-A papers.

It is, perhaps, to be expected that this company should continue its aggressive policy of co-operation by securing the services of one of the leaders of the printing industry in America.

Mr. Borden is particularly fitted for his new work. He knows printers and printing as well as any man in the country. He has played a major part in putting the industry in its present important position. He conceived and executed the three-year plan of the United Typothetae of America that is now a recognized milestone in printing history. The United Typothetae of America under his direction made great progress.

J. L. Barchard Makes Change

J. L. Barchard severed his connection with the Chicago Mill & Lumber Company, effective October 1st of this year, to become Vice-President and General Manager of Hummel & Downing Company, Milwaukee, Wis.

Mr. Ross, predecessor of Mr. Barchard, resigned to take up the management of the Hummel-Ross Fibre Corporation, of Hopewell, Va., but continues as a Director of the Hummel & Downing Company, as also do George McKowen, Secretary, and Albert Zinn. J. P. Hummel continues as President of the Company, and with other members of his family, continues to hold the majority of the stock. There has been no change affected in the policy of the organization.

M. Hazen Chase with A. W. P. Co.

The American Writing Paper Company has recently announced the appointment of Mr. M. Hazen Chase as assistant to Mr. R. R. Campbell, Vice President, in charge of manufacturing. Mr. Chase comes to the company rich in experience, with a technical and practical knowledge that should be a decided asset to the Eagle-A organization.

For the past five years, Mr. Chase has been office manager and assistant to the superintendent of the Copsecook Mill of the S. D. Warren Company located at Gardner, Maine.

Byers Is Building a Full-Revolving Crane

The John F. Byers Machine Company, Ravenna, Ohio, has announced that it is now building a crane of the full-revolving type. Production is said to be well under way, and a good-sized schedule is expected to be shipped during the late winter.

The new machine has been introduced as a running mate to the Byers Auto-Crane, more than 700 of which are now said to be in service. The insistent call for a full-circle swing machine to supplement the Auto-Crane with its half-circle swing, leads to the introduction of the later model.

The Company has taken pains to emphasize in answer to many questions, that the full-circle type is not to displace the Auto-Crane, but is to give all Byers products a wider usefulness by handling jobs where a half-circle swing would not fit in.

The machine is equipped with differential in drive for road wheels or apron tread, a feature easily appreciated from a standpoint of turning curves, especially in soft ground and when using the apron treads or clips on driving wheels.

The Apron Tread Traction is the Byers Standard, using four complete units which have a decided advantage in area of bearing on the ground, and ability to climb uneven ground with a minimum effect on the upper mechanism of the machine.

The Road Wheel Machine may be converted into an Apron Tread Traction by the owner in the field.

The Railroad Type Crane drives all four wheels and is equipped with a coupler bar for switching cars and is capable of attaining ten miles per hour traveling speed.

The Steam Machine is equipped with 42" Butt Strap, A. S.

Millspaugh Suction Rolls and Shower Pipes

Over 700 Rolls in Service to date. 9 Rolls Per Month Shipped Since January! 48 Orders in our shop December 1st. In less than one year 50 repeat orders for Suction Rolls from satisfied customers who had one or more already in service.

More Than 7 Miles Millspaugh Shower Pipes Shipped to Date

THE SANDUSKY FOUNDRY AND MACHINE COMPANY
Sandusky, Ohio

Announcement

¶ I am severing my connection with Parsons & Whittemore, Inc., 299 Broadway, New York City, for whom I have built up and managed the Mill Supplies Department with exceptional results.

¶ I am open for any proposition in Mill Supplies, Pulp and Paper.

ALFRED BUNGE
Bellair Drive *Phone Dobbs Ferry 68*
DOBBS FERRY **NEW YORK**

New Sand Filter

A SPECIAL filter for paper mills, producing all the results the paper manufacturer desires. It is a modification of the well known Hungerford filter adapted to paper mill use. It is constructed of concrete, strictly wrought iron pipe, brass strainers and especially prepared silica sand. It is as durable and efficient as can be built at any cost. It can be sold at a very low figure.

This filter gives perfectly clear water, washes thoroughly, does not require renewal of the sand bed, is absolutely reliable in the performance of its duty and requires a minimum amount of attention.

Send for full particulars

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PHILADELPHIA, PA.

EASTWOOD Wire Mfg. Co.

Fourdrinier Wires
Cylinder and Washer Wires

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WE ALSO MANUFACTURE

Valves, Unions, Cocks, Fittings, Digester Parts, Castings, etc., for Sulphite Mills from Our Perfection Bronze

Fitchburg Duck Mills
ESTABLISHED 1844
FITCHBURG, MASS.
MANUFACTURERS OF
STANDARD AND MULTIPLE
DRYER FELTS
English Weave in Two, Three, Four, Five and Six Ply—60 Inches to 176 Inches in Width
Fine Faced Felts for Fine Papers. Absolutely no felt marks in paper. TRIUNE Three Play Felts for Coarse Papers.

Lockport Felt Company
NEWFANE, NEW YORK
MAKERS OF
Fine Felts for Fine Papers
ALSO MAKERS OF
Best Felts for *all* Papers
SATISFACTION GUARANTEED

SIGNODE SYSTEM

Framed Reams, strapped with Signode System
Signode straps insure delivery of framed paper bundles in the same condition they leave the mill. Cheaper than rope. No battered corners. Liberal trial arrangement.
Write for Particulars and Prices
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The CHICAGO
Approved Portable
WATCHMAN'S CLOCK
with its special Waltham movement, its lock stations and its superior quality throughout, is especially desirable for mills and factories and for either in-door or out-door patrol.
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M. E. Boiler and 7"x7" Byers High Duty, Horizontal Barrel Guide, Non-Reversing Hoisting Engines.

The Gasoline Machines are equipped with 45 H. P., four cylinder engines, especially designed for this class of service.

The Electric Machines are equipped with approximately 40 H. P. motor depending somewhat upon the kind of current available.

The Company has just finished a large machine and erecting shop of modern design, adjoining its present plant at Ravenna. This building will provide much-needed space for the construction of established Byers lines, as well as for the new Crane.

Ball Engine Co. Moves Headquarters

"Ball Engines until recently made by the Ball Engine Company, Erie, Pa., are now being built by the Erie Ball Engine Company, Pittsburgh, Pa. The new company was incorporated and this business transferred to Pittsburgh, due to the lack of adequate manufacturing facilities at Erie. A large modern factory especially equipped for engine work and providing means for a greatly increased production is at present in full operation.

"District agencies which have been handling the sales of Ball Engines will be continued without change in their personnel."

Discussing many new methods and inventions tried out to obtain the greatest energy from coal, due to a coal shortage the world over, the noted engineer, Kurt Lasswitz, of Berlin, Germany, declared that liquid coal will help solve the world fuel problem. Coal under 200 atmospheres pressure, writes Lasswitz, heated to between 540 and 720 degrees Fahrenheit, and mixed with hydrogen gas, becomes liquid, and its energy, he says, is greatly increased. In the near future liquid coal will be used by many big plants, he declares.

The new paper mill of the Laurentide Co., Ltd., Grand Mere, P. Q., Canada, has been started. This will give the company about 40,000 additional tons of newsprint annually, which will bring the capacity of this company's plants up to 400 tons a day. The two newsprint machines in the new mill were built by the Dominion Bridge Co., of Montreal, and are the first paper machines ever built in Canada.

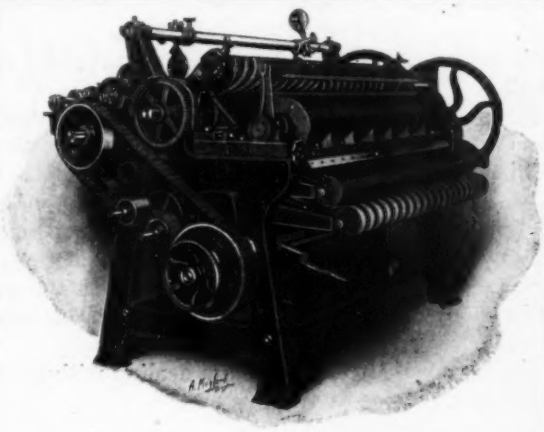
The North Peshtigo Pulp Co. is making plans to build a large power dam at Caldron Falls and also to build a pulp mill at Lakewood, Wis. It is said that a half million dollars will be invested in the two projects. James Leffel Co., of Springfield, Ohio, has been awarded the order for two turbines, each of 2,850 horsepower. The generators and hydro-electric equipment was ordered from the General Electric Co.

The Godfrey Conveyor Co., of Elkhart, Ind., is offering a prize to owners of this Company's conveyor systems to see in how short a time cars can be unloaded. The prizes range from $50 to $10, and everyone having a Godfrey conveyor is entitled to enter the contest. Anyone interested should write the company at their office.

The English China Clays Sales Corporation, importers of clays for the paper manufacturing industry of 33 West Forty-second street, New York, has reduced its capital stock from $500,000 to $400,000, according to a notice filed with the Secretary of State at Albany, N. Y.

Mr. C. B. Merrell, who has been for a number of years in the general offices of the Economy Fuse & Manufacturing Company, has been appointed District Sales Manager of the Philadelphia office, 523 Widener Building, vice E. J. Watson, resigned.

The Great Lakes Paper Stock Co. is a new organization at Buffalo, formed to conduct a waste paper business at 212 Ohio Street.



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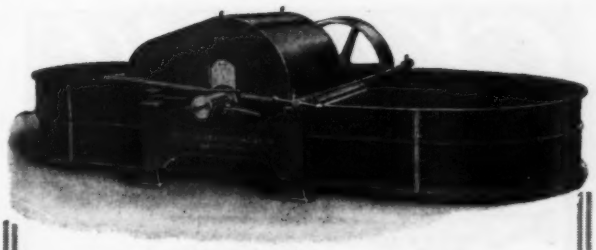
Single, Duplex, and Diagonal

CUTTER KNIVES
PATENT TOP SLITTERS

Hamblet Machine Co.
LAWRENCE, MASS.



"Dayton"
Beating Engines
are Built
for
Heavy Duty

Dayton Beater and Hoist Co.
DAYTON, OHIO

JENSSEN ACID TOWERS
at Nekoosa Edwards Paper Co.
Port Edwards, Wisconsin

60 Jenssen Tower Installations

GREAT ECONOMY has been effected in mills where the

JENSSEN Two-Tower Acid Systems

has been installed

Sixty Installations now in operation or building

U. S. A., Canadian and European Patents

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THE HILL CLUTCH CO.

Plant and General Office at Cleveland, Ohio

Hill Clutch Equipment for Transmitting Power

In Pulp and Paper Mills

THE HILL CLUTCH CO.
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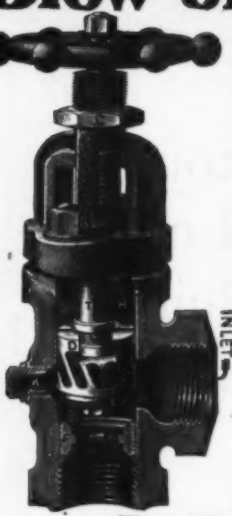
CYCLONE
Blow-off Valve



Built in accordance with the revised State Boiler Law, without bolt-slots in either body or bonnet.

Has outside screw and yoke top and the Powell Patent Pusher Packing Gland.

A SELF-CLEANING BOILER VALVE.

Disc and Seat Ring made of our incomparable wearing metal, "POWELLIUM BRONZE."

Ask your dealer for "Powell" Boiler Valves" or write us.

Boiler Valve Booklet on Request.

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DEPENDABLE ENGINEERING SPECIALTIES.
CINCINNATI, O.

Appleton

Felts and Jackets
Manufactured By
APPLETON WOOLEN MILLS
APPLETON, WIS.

Paper Fillers

(*Continued from page* 1377)

with colors which are non-resistant to alum and alkalies.

9. Don't buy fillers of dealers who cannot satisfy you that they will be able to ship you a filler which will be absolutely uniform from month to month.

10. Don't forget the fact that it is absolutely impossible for anyone to intelligently judge and select fillers, without first spending a considerable amount of time getting intimately acquainted with the way the various fillers act under different sets of conditions.

11. Don't be too credulous in dealing with fillers; it absolutely doesn't pay.

Testing Tearing Strength

(*Continued from page* 1393)

of the point of application of the load" doesn't mean anything. If he means that the stress is dependent on the stretch of the paper as a result of the load, he is mistaken, for the stress remains constant regardless of the stretch or strain which results from the stress, as a result of the application of the load. In the next sentence, he is not clear again, and it may be he is confusing stress with strain. He says any stress may exist, when I believe he means strain, for the stress remains constant. When stress or load of any kind is applied to a material the measure of the strain resulting from such stress is the basis of all scientific tests and has led to the establishment of the stress strain diagram. With proper handling a transverse test on paper for its tearing properties, a stress strain diagram or a graph can be drawn that will show the result of these observations, which will clearly illustrate the action of the paper under any stress or series of stresses, showing just how much the paper will stretch before it reaches its ultimate and gives way—its tear strength. It is perfectly analogous to a test on steel for its elongation, Modulus of Elasticity, and Tensile or Ultimate, all of which are accepted as standard tests the world over.

No. 4. We heartily agree, time is a factor in all tests and is one of the regular conditions stipulated in all standard tests. Student testing engineers are taught this among their first lessons.

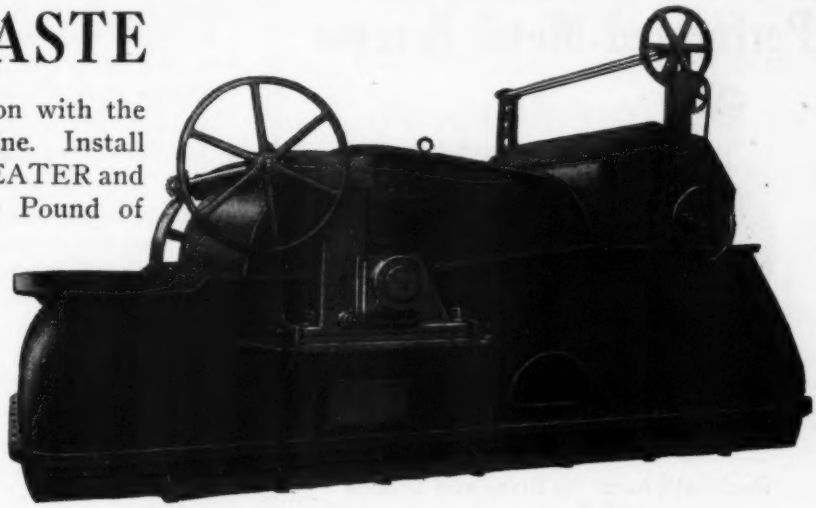
The last statement A. E. makes is not substantiated by the facts, as there are countless figures in existence that represent tests on papers that run as uniform as the paper itself, and as it is possible by present manufacturing practice to make it.

The statement, "Even though they be testing the same paper under the same conditions they will obtain different strength values" is not in accord with his original premise, that of condemnation, but is a strong recommendation, for according to his own words in another part of his statement, he says paper is a very non-uniform material, and tests that are

DON'T WASTE

Your Power by the Ton with the Ordinary Beating Engine. Install an UMPHERSTON BEATER and Save Power on Every Pound of Stock.

"We Build our Machinery to Meet Your Requirements"



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Information and Booklets describing our Specialties sent to you on request

HOLYOKE MACHINE COMPANY, Holyoke, Mass.

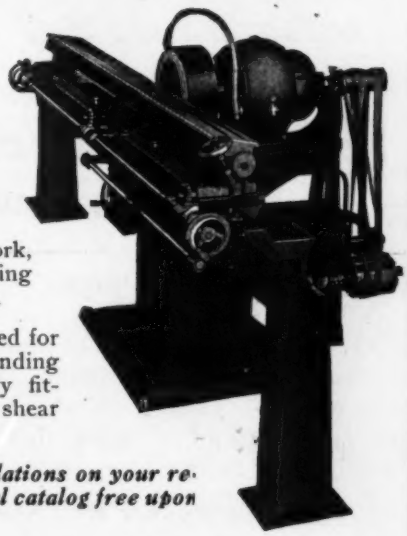
SOME OF THE "HOLYOKE" SPECIALTIES—Chilled Iron Rolls, Cotton Rolls, Paper Rolls, Wood Pulp Grinders, Wood Barkers, Wood Chippers, "Umpherston" Beaters, Rag and Paper Dusters, Washing and Beating Engines, Reeling Machines, Hydraulic Pumps, Hydraulic Presses, Coated Paper Strainers, Turbine Wheels, Gearing and Shafting, Calenders, Platers, Rag Cutters

Scientific Grinding Development

A Machine for Every Purpose

Straight Wheel, Cup Wheel, Ring Wheel Grinders. Hand or automatic, wet or dry grinding. Traveling grinding wheel, stationary work, or stationary grinding wheel, traveling work.

Full automatic, adapted for every variety of grinding service in scientifically fitting knives, saws, shear blades, etc.



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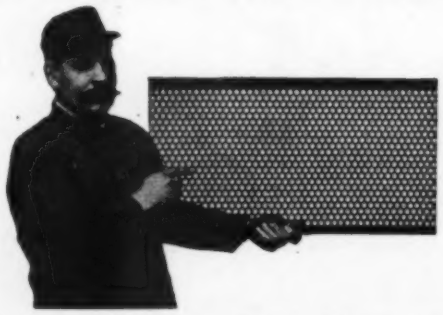
Perforated Metal Screens



Of Copper, Brass, Steel, Bronze, or Any Other Metal

Perforations of All Sizes and Shapes

For use in Pulp and Paper Mills—Centrifugal Screen, Drain Bottoms, Filter Plates, Pulp Mashers, Suction Box Covers, etc.

Accuracy in all details and excellence of quality at lowest consistent prices

The Harrington & King Perforating Co.

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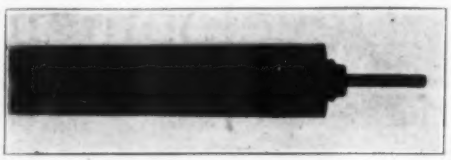


Rubber Covered Felt Rolls

DO YOU KNOW

That we cover Felt Rolls with Rubber that give better service than Brass Covered Rolls?

Our Rolls wear perfectly smooth. When once installed they require no further attention.

Write for names of satisfied customers using our rolls.

We Are Rubber Roll Specialists
Our Press Roll Stocks Are
the BEST on the Market.

The American Wringer Co.

Dept. R WOONSOCKET, R. I.

reliable should naturally show different strength values.

Summing up the whole thing I am convinced A. E. has been badly misinformed regarding the tests he attempts to condemn.

Cost Accounting

(*Continued from page* 1399)

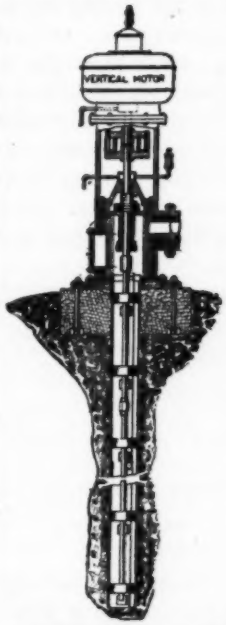
executive is the budget. The budget should be made up of reserves, at hand and anticipated through profits, and should provide the control of disbursements. This does not necessarily mean for dividends and capital expenditures alone, but for active employment of all working capital to the best possible advantage. It can and should be revised periodically to check up all advance expectations and predictions. Under the existing income tax laws, there should be included in this budget, either directly or by subdivision, provisions for tax payments not only to insure the use of these reserves and release in the proper amounts, when and as due, but, also, to estimate monthly, by use of proper tables, your proportionate donation to Uncle Sam, in order to avoid a sudden and possibly serious awakening at the year's end.

This budget may be quite useful to finance changes, recommended particularly by your engineers, for you know all engineers seem to have an excellent faculty for making savings by changes or new installations, which, nevertheless, cost money. Without a budget, it is difficult to arrange for proper sequence of authorizations, unless unlimited capital is at hand, to accomplish the quickest return. Then again, we occasionally run across someone who is a little too theoretical, or who has imaginary ideas of the cost of installation. The cost department can however, exercise the necessary control by proper and prompt records, following up specific work. As an example, we had occasion to build a small coffer dam a few weeks ago, which was originally estimated by someone at $250.00, but which was put down at $500.00. The cost figures, three days after the dam was completed, showed that the actual cost was $881.00. Upon investigation, it appeared that the engineer and erecting superintendent had an argument about the method to be employed. The superintendent being the man on the job, used $250.00 of labor and material, all of which were washed down the stream. It was then put in by a second method with the above results.

Control of Manufacturing Department

Going over to the manufacturing department, in the old days, the "also-rans" slipped by unless the executives were good "watch dogs," because there was no data that was daily and periodically gathered by anyone, which could be shown to the superintendent or foreman at the end of the month, with that demanding word, "Why?" As a result, at the end

Gregg Propellor Pump



This pump is especially well adapted for paper mill use where tubular wells are used for water supply.

WHY

This pump has great capacity and will deliver more water from tubular wells than any known pumping system.

When suction pumps and air lift systems fail to secure the water, try a GREGG Propellor Pump.

Many of the largest Industrial Plants, Packing Houses, Paper Mills and Railway Companies have adopted the GREGG Propellor Pump for their use.

THERE IS A REASON

Write for particulars

GREGG PUMP COMPANY

KANSAS CITY, MO.

The Stickle Automatic Steam Control for Paper Machines

WE wish to emphasize the word "automatic." This with us means that the steam follows changes that come to the sheet from free to hard drying stock or any ordinary changes in weights. A control that does not do this in itself is not automatic. This makes a better sheet of paper. We guarantee to hold the moisture at any point you wish with ½ of 1% change. Furnished on 60 days' approval.

OPEN COIL HEATER & PURIFIER CO.

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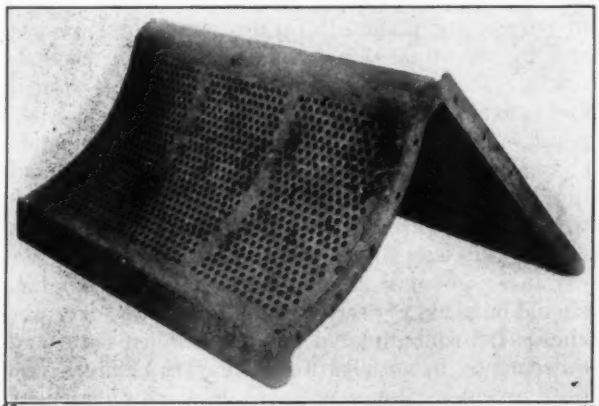

Because there are no moving parts this is a very simple but very efficient device. Patent No. 1,271,426 issued to Mr. Brownell Buehler, July 2nd, 1918.

The Shartle Continuous Beater Company

MIDDLETOWN, OHIO

When it is a matter of

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of the year there was a very rude awakening; and frantic efforts were made to catch up or change some methods, which had been in effect for too long a period with disastrous results. Now, proper control of these departments in many mills, may be exercised by their cost department. For this, the expense analysis plays an important function, for as the name implies, it analyzes all expenses by periods or months, making a record well worth a proper and conscientious review, periodically, by the executives in order to exercise the necessary control. Study of this discloses items that retard operations or earning power, some of which are:

1. Hidden or unknown items of expense.
2. Wastes and leaks.
3. Faulty factors in organization.
4. Inadequate or obsolete equipment.

Viewed from another angle, the following questions may be asked:

A. Do you know what your mill is most qualified to produce?

B. Is your plant efficiently operated?

C. Is every department of your plant arranged and equipped to produce at maximum earning power?

The Purchasing Department

With the proper assimilation of data, the purchasing department may, also, be controlled by the cost department. Purchasing agents centre their efforts in purchasing materials for present or future use, and in following this by daily, order or contract prices. The cost department, however, can step in and provide summary sheets periodically, which will point out to the purchasing department, the purchases that most vitally affect costs, the corresponding percentages, the average, periodic or yearly prices, etc. Through their knowledge of manufacturing, they can suggest points of investigation, for instance: changes in containers for supplies, which should be made to decrease handling costs; over purchases for contemplated but not fulfilled future requirements, in anticipation of market changes; and dead inventory items, although in some mills this is controlled by the storekeeper.

The Sales Department

And, last but certainly not least, one department of a paper mill, the control of which by costs, we have heard a great deal about, is the sales department. Much of this, however, dealt with grade and weight costs, special order costs, etc., which are excellent points to dig into; but, from an executive's standpoint, the cost department also, can bring out figures to control the general sales in more of a statistical manner. For instance, the yearly and monthly sales analyzed as to territories and customers, in order to continuously control the sales department for proper distribution. Selling commissions is another big

item on certain papers which are often too quickly glanced over by the sales manager and which, if brought out in the proper manner, would be quite apt to change the selling policy. Analyze the cost of performing certain functions in the sales department, such as telephoning. One sales manager that I know, used his telephone so often that the enamel was worn off before their antiquated cost department awoke to the tremendous telephone bills.

The sales and manufacturing departments may conflict on two points; namely, grades or weights, and routing of orders through the mill, which sometimes require the accountant to referee. In times of extreme competition, a keen sales manager, bent on keeping his mill running, may seek new fields which may not prove to be attractive from the cost standpoint, due to inadaptability of the equipment to handle economically the weight or grade, or due to a narrow trim. Again a sales manager may be over zealous in service to his customer, and not to the mill, in suggesting that some small order be tacked on to another run. A wide-awake cost accountant will soon discover the extra expense, and hindrance to production, that is caused by failure to "Bunch all Hits."

Graphic Charts

In all of this work, no accountant should overlook one of the best tools at his command for presenting and comparing facts—Graphic Charts. These may be as elaborate or as simple as desired; but, in any event, they show high or low spots, allowing an executive to make quick comparisons better than any sheet of figures.

In conclusion, I must apologize for absence of cost details, but I so sincerely feel the magnitude of the field for all cost accountants that I have striven to outline some of the main ways through which an accountant may point out the many bypaths leading to failure, and control the progress on the road to Success.

Saving Fuel

(*Continued from page* 1371)

centage of CO_2 by itself becomes a most reliable index to the greatest loss of all—the sensible heat energy wasted up the chimney.

Savings by Controlling Chimney Losses in a Small Plant

As a typical example of what can be done to save fuel by the simple regulation of the percentage of CO_2 it will undoubtedly prove of interest to compare the two CO_2 records as shown in Fig. 7. They were made at a small New England plant. A CO_2 recorder was connected with the boilers and placed in the office of the chief engineer without the knowledge of the firemen. They knew, however, that a twenty-four hour evaporation test was to be conducted and were

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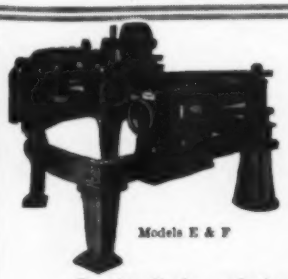

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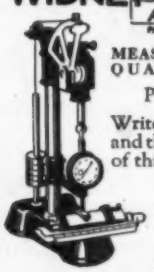
WIDNEY MODULIMETER
A TEST
PATENTS PENDING



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instructed to utilize every effort to maintain the load during that period with the least possible amount of fuel. Although they worked hard to make a showing for themselves the chart on the left illustrates that great variations occurred in the percentage of CO_2 and that the average was quite low. After the test had been completed, an auxiliary CO_2 indicator was placed at the boiler front for the firemen's particular benefit. They were advised that another test of the same duration would be run, but that this time only two things would be expected of them, viz., they were to maintain the steam at the required pressure and keep the CO_2 as high as possible. Not having heard of CO_2 before, the chief engineer simply pointed out the indicating column with a statement that it must be kept high and that the way to keep it high was to make the necessary adjustments of draft, thickness of firebed, etc. They were particularly instructed, however, to make only one change at a time in any adjustment, and then note the result; if the indicator went up they would know that the change was made in the right direction and if it went down they would know the change was made in the wrong direction. They were allowed to use their own ingenuity and to manipulate all furnace adjustments as they saw fit. They soon gained confidence and in a few days expressed their belief that the proper ratio of air to fuel burned could be maintained by watching the CO_2 indicator and making adjustments accordingly. The second evaporative test was thereupon started. The chart on the right-hand side shows the results. This record is consistently higher than the first and the percentage of CO_2 is comparatively free from irregularities. The actual test showed a saving of 9.9 per cent made solely by the efforts of the firemen who had never heard of CO_2 before. Showings of this kind are being made repeatedly at hundreds of prominent and smaller plants throughout the country.

Fig. 8 shows the instruments used for determining the percentage of CO_2. The one on the left serves as a constant working guide for the fireman while the one on the right simultaneously traces a record of CO_2 on a chart in the engineer's office, thus enabling him to keep tab on the work of the fireman.

The scale, Fig. 9, will be found useful for estimating the value of the fuel lost up the chimney due to low CO_2. It is based on 600 degrees chimney temperature and high carbon fuel.

A New Beating Engine Attachment

A twenty-five hundred pound beater furnishing 118 tons of chip board stock per day sounds fabulous and yet this very thing is being accomplished at the Chicago Mill and Lumber Company of Chicago, Illinois. This does not represent the capacity of the beater but is all that the paper machine is able to use. The beater must consequently be closed down part of the time.

This remarkable record is caused by the addition of two attachments, one at each end of the beater which make the machine continuous.

Most board or paper mills do not have 2500 lb. beating engines, but the majority do have 1800 lb. engines. It is claimed that an 1800 lb. beating engine with one of these attachments will handle seventy tons of chip board per day.

It is claimed that this device will enable a beating engine to not only prepare several times as much stock as an engine would without the attachment, but that it requires much less horse power from the fact that it is not necessary to put the roll down at any time.

An 1800 lb. engine with this attachment would, it is said, require about five horsepower more than the engine would ordinarily need if it was run with the roll up.

It was quite a sight to see this 2500 lb. beater turn out the stock so fast that it kept three men at each end busy breaking open bales of waste material and feeding them into the beater.

This machine is the product of James Murphy, the master mechanic of the Mill with the help and assistance of E. J. Raney, superintendent. Mr. Murphy has devoted considerable time studying the development of the machine which has already done more than it was ever anticipated.

At the annual meeting of the stockholders of the United Paperboard Company recently, all the retiring directors were re-elected with the exception of Charles C. Adsit, who was succeeded by Paul C. Downing. Retiring officers were subsequently re-elected by the Board of Directors.

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Ask Us for Our New Catalogue
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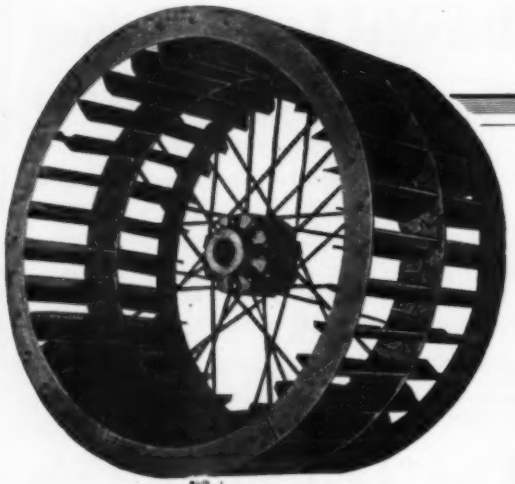

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play an important part in the economical production of paper. They are individually designed to fit given mill requirements. Used for drying and ventilating, they eliminate that objectionable ceiling drip in the machine room. They are the ideal equipment for forced and induced draft, forced heating, moisture absorption; in fact, for any purpose requiring a constant, unfailing supply of air. Write for bulletins and a plant analysis by our engineers.

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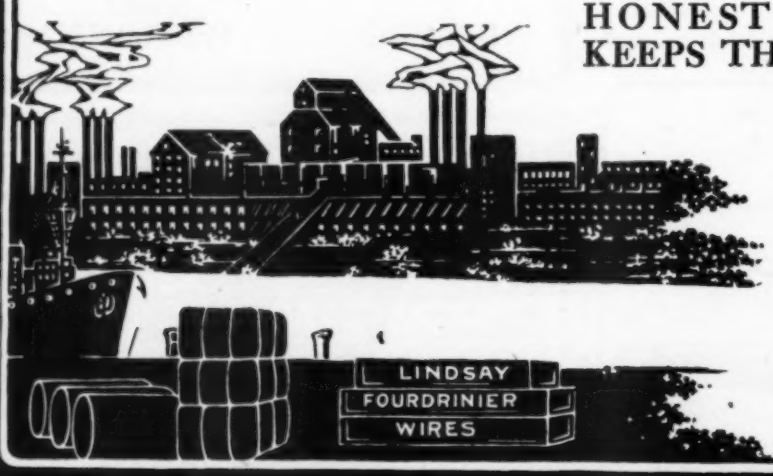

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The Lindsay Wire Weaving Company

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"Ask any Papermaker"

THE paper market is in far from an active condition. Consumers and dealers are buying solely in hand-to-mouth fashion, limited orders to paper actually and immediately needed, and the prolonged period of listless demand has obliged some manufacturers to close down their plants temporarily and others to materially curtail running schedules. Paper producers, from all indications, are pursuing a policy of reducing output rather than lowering prices to a non-profitable basis in the hope of securing sufficient business to enable them to operate full. That this is the proper procedure under prevailing circumstances seems proved by situations that have developed in other manufacturing industries, where prices have been cut with a vengeance in anticipation that consumers would resume buying in more normal volume and where the sharp recession in prices has merely led to buyers holding off to a greater degree

When one stops to analyze prevailing business conditions, it is readily seen that the present situation in the commercial world has been brought about chiefly by consumers losing faith in the stability of prices on various commodities. That a revival of buying activity cannot be expected until prices have settled at least for a time lengthy enough to permit consumers to regain confidence in values is the opinion expressed by some of the leading business men of the country, and it would seem therefore to be the bounden duty of manufacturers to exert their every effort toward the reestablishment of public confidence in commodity prices and to mould their business policy with this in view. Paper manufacturers whose cost of production has decreased through declines in raw material prices and other reasons are readjusting quotations on their product accordingly; those whose cost of production has not diminished are wisely curtailing production rather than cutting prices to fictitious levels where they have to market their goods at a loss. There is nothing in the present situation to indicate that the marking down of prices will induce buyers to enlarge their purchasing operations. Instead, conditions existing in some commodity lines show that the drastic reduction of prices simply prompts consumers to hold off in buying to a greater degree. Due to tight money conditions and the general uncertainty over future possibilities, together with large stocks of most manufactured goods, the average buyer is determined today to refrain from purchasing any article for which he fails to have direct need. That this situation will not continue indefinitely goes without saying. Most business men express confidence that the first quarter of the new year will witness a marked change for the better in all lines of commercial activity. It is felt that by that time prices generally will have become more stabilized and that buying will revive to something approaching normal proportions. In the meantime, it behooves paper manufacturers and distributors to follow a reserved policy; to do what they can to bring about stabilization of values and markets, and not to grow panicky and upset matters by throwing merchandise on the market to be sold for whatever can be realized for it.

The decline in paper prices during the past several months has applied almost solely to spot supplies of the various kinds of paper. Contract quotations are firmly maintained practically without exception and mills almost as a unit are refusing to enter into commitments covering future deliveries except at the same prices they have heretofore received. The leading producer of news print paper in the United States has announced that its contract basis on roll news will be the same over the first quarter of 1920 as prevails during the final quarter of this year, namely, 6.50 cents per found f. o. b. mills in carload lots. Other manufacturers of paper of all varieties are following the lead of this producer and are fixing prices to contract customers for next year at current contract levels. The maintenance of contract prices is an apt illustration of the fundamental strength of the paper market. No one denies that prices on spot deliveries of some grades of paper reached excessive heights earlier this year, and it is a source of gratification to at least some manufacturers and merchants to see spot prices getting down to levels where they are more in keeping with contract prices. Furthermore the fact that contract prices for next year are being maintained at present ruling levels goes to prove that manufacturers selling their output at such figures have not taken advantage of the tremendous demand existing for paper since the war and were fully justified because of increased cost of production to advance prices to levels at which paper is being sold to consumers on contract.

Spot quotations on about every grade of paper have continued to recede in recent weeks. News print in standard rolls is available to open market buyers at as low as 7 cents per pound at mills, with reports heard of some tonnages of foreign news print having been sold at an eighth of a cent a pound below this figure. This means that transient buyers are obtaining news print within half a cent per pound of the price quoted to contract customers. Machine finished book papers are quoted at around 13 cents per pound for spot shipments, with the contract basis maintained at between 9.50 and 10.50 cents at mills. Wrapping papers are holding fairly steady. No. 1 domestic kraft is quoted at 12 cents, or a trifle less, f. o. b. mills, and No. 2 kraft at a cent under this level. Fine papers rule at close to previous price ranges. There is but a light demand for high grade bonds and ledgers but cheaper qualities are moving in moderate amounts. Boards are little wanted by consumers and quotations are at best irregular and mostly on lower schedules. Plain chip board can be obtained at $50 per ton at mills and probably for less, while filled news board is available at $60.

At the annual meeting and election of officers last month of the Waste Merchants' Association of New York, Alfred J. Moran, of E. B. Thomas & Company, Inc., was re-elected president for the ensuing year; Walter Clark, of the Maurice O'Meara Company, was again chosen vice president; Walter R. Hicks, of Daniel M. Hicks, Inc., was re-elected treasurer, and Fred H. Chase, of Chase & Norton, Inc., was again chosen secretary. The annual reception and dinner of the association, whose membership embodies all the leading paper mill supply firms in New York, will be given in February, and at the annual meeting a committee of three, composed of E. Salomon, Fred H. Chase and Walter Martens, was selected to effect arrangements for the yearly affair.

The Cost Association of the Pulp and Paper Industry is now comfortably settled in its new offices on the sixth floor of 18 East Forty-first street, New York, whence it moved recently from its former location on Fifth avenue.

The capital stock of the Export Division of the Union Card and Paper Company, of New York, has been increased from $10,000 to $25,000.

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Papermaking Rags

Activity in papermaking material is at a lower point than it has been in a lengthy interval. With paper manufacturers experiencing quietness in their own product, few of them are absorbing raw stock excepting when in immediate need, and the aggregate amount of rags moving into consuming channels is so small as to scarcely establish a real market. There is no question that many grades of rags have declined in value to levels where the prices now quoted are decidedly attractive from the buyer's point of view. The probabilities are in favor of an advance rather than further recession, and yet papermakers cannot see the logic evidently in absorbing supplies under prevailing uncertain conditions when not directly in want of stock. There are some mills which are quietly placing contracts for rags for future shipment, but this character of business is of narrow compass both for the reason that only certain paper manufacturers are satisfied to buy ahead at present and also because few dealers are willing to enter into commitments covering forward deliveries at the current range of prices. There seems little likelihood of any scarcity of rags arising during the next few months. While collection and sorting have been curtailed to some extent, the production of rags nevertheless has continued and there is probably a substantial supply in dealers' hands awaiting an outlet. The drop in prices, particularly on old rags, has been so constant and of such dimensions, however, that there is small doubt that a revival of demand would be quickly followed by an uptrend in the value of many grades. Notwithstanding, consumers appear to be working on the theory that it is more advisable to hold off in purchasing until their probable requirements are better outlined, and the business now passing consists almost entirely of transactions involving small tonnages needed by mills for immediate use.

Importations of rags from Europe have shown a marked decrease recently. Importers attribute this to the decline in prices here, it being their contention that they cannot profitably bring rags in from foreign sources to sell in competition with domestic material at the prices prevailing. There are, however, from all indications sizable supplies in various European countries which can be readily obtained at slight increases in price. Most of the rags now being imported are against contracts and are moving toward mills as quickly as they are landed.

Current quotations f. o. b. shipping points are:

New Stock—	New York and Chicago
White shirt cuttings, No. 1	22.50-23.00
White shirt cuttings, No. 2	12.50-13.00
Fancy shirt cuttings	13.00-13.50
Washables, No. 1	10.50-11.00
Unbleached muslins	17.50-18.00
White lawns	20.00-21.00
Overall cuttings, blue	12.00-12.50
Black silesias	7.00- 7.50
Old Stock—	
Whites, No. 1 repacked	10.00-10.50
Whites, No. 2 repacked	4.25- 4.50
Whites, house soiled	2.75- 3.00
Whites, street soiled	2.50- 2.75
Thirds and blues, repacked	3.25- 3.50
Thirds and blues, rough	2.50- 2.75
Black stockings	2.75- 3.00
Lace curtains	7.00- 7.50
Cotton canvas, No. 1	5.00- 5.25
White cotton batting	3.40- 3.60
Roofing, No. 1	1.10- 1.20
Roofing, No. 2	1.00- 1.10

Rope and Bagging

Old ropes and baggings are in very limited demand and prices have undergone further recession. Paper manufacturers are absorbing these commodities only in spasmodic fashion, coming into the market at intervals when pressed by necessity and even then confining their orders to tonnages immediately required. The bagging situation shows a top-heavy condition because of a surplus of supply above consumers' wants, and while old rope is in a better statistical position, there appears to be ample supply to meet the needs of buyers, and prices, along with those on other kinds of papermaking material, are on the downslide. Importations recently have fallen off to some extent, thus reflecting the holding of stocks by dealers in European countries for higher prices. The probabilities are, however, that owners of rope and bagging abroad will in due time be more willing to accept such prices as are to be obtained and will seek to market their goods in the United States.

Buyers are securing the small supplies desired at very much their own figures, and although values have sunk to comparatively low levels where there is little room for further declines, it seems that it will require a considerable spurt of buying, particularly of bagging, to promote any rise in quotations. Roofing bagging is especially weak, owing to the general retirement of felt manufacturers as buyers in recent weeks. Prices f. o. b. shipping points follow:

	New York and Chicago
Gunny, No. 1 domestic	2.25-2.50
Gunny, No. 1 foreign	2.00-2.25
Scrap bagging, No. 1	1.75-2.00
Roofing bagging	.75- .85
Wool tares, heavy	2.50-2.75
Wool tares, light	2.25-2.50
Manila rope, No. 1 foreign	5.00-5.25
Manila rope, No. 1 domestic	5.00-5.25
Sisal strings	3.25-3.50
Mixed strings	2.50-2.75

Old Papers

Not in a lengthly interval has the market for old papers been in quite the dull condition that has prevailed during the past few weeks. With box board mills and other leading consumers almost entirely out of view as buyers, dealers have been pressed to move accumulations of stock and have accepted surprisingly low prices in some instances. Waste paper is a peculiar commodity in that when it is in demand it is worth all kinds of money but when consumers do not want it, it becomes next to valueless for the reason that it does not pay to store it. Obviously, therefore, with demand at the low level that has existed recently, prices have continued to tumble with marked rapidity, and the present range of quotations presents quite a contrast to those prevailing not so long ago when the market was at its zenith. Another peculiarity of old papers is that consuming mills can scarcely take advantage of low prices to lay in large stocks because waste paper must be kept under cover and the average mill

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Let us not pay too much attention to prices but rather give heed to the great need.

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FINE WRITING PAPER SIZING

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STANDARD BLEACHING POWDER

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PHILADELPHIA, PA.

can store only a limited tonnage as it requires much space to hold waste paper. When board and paper manufacturers consequently are not consuming, they are obliged to halt buying, which in turn results in an accumulation of stock at packing sources.

Prices on some grades have been cut in half since our last report. For example, folded newspapers are quoted at 75 cents per hundred pounds, against $1.50 a month ago, and No. 1 mixed papers are available to mills at 45 to 50 cents, contrasted with a former price of $1. Shavings are substantially lower, as are old books and magazines, ledgers, overissue and white news, and kraft paper. In New York, quite a novel situation has developed as a result of the drop in values. Large packing concerns in that city attempted to cut wages of their employes, and paper collectors and handlers immediately went on strike, thus bringing production in that center close to a standstill. There is no doubt that tremendous quantities of old paper are being burned up or otherwise destroyed during the present period of slack demand, which while a great economic loss which the paper industry will feel in a general way, should have no immediate influence when consuming mills are again in need of increased supplies. F. o. b. shipping point quotations are:

	New York and Chicago
Hard white shavings, No. 1	7.75-8.00
Hard white shavings, No. 2-3	6.75-7.00
Soft white shavings	7.00-7.25
Colored shavings	4.25-4.50
Heavy book, No. 1	1.75-2.00
Crumpled No. 1	1.50-1.75
Ledger stock	3.50-3.75
Kraft, No. 1	3.50-3.75
Manilas, No. 1	1.50-1.75
White blank news	3.75-4.00
Overissue news, No. 1	1.30-1.40
Folded news	.75- .85
Mill wrappers	.90-1.00
Box board cuttings	.65- .75
Mixed paper, No. 1	.45- .55
Common paper	.35- .40

Chemical Pulp

The chemical wood pulp trade is marking time. There is no concerted demand for any grade of pulp from any source and the aggregate movement of supplies toward consumption is of rather slight importance. This is merely to be expected in view of the general condition of the paper market, and producers and dealers are biding the time when consumers are in more of a buying mood and are exerting little pressure on customers. Pulp values are following much the same trend of paper prices. Contract quotations on practically all grades of pulp are being well maintained, and manufacturers as a general rule are refusing to accept orders covering future deliveries excepting at the same basis they have formerly received, whereas spot shipments of pulp are changing hands at marked concessions, so much so that spot prices are getting pretty near to contract levels. Indications point to no large tonnages of any kind of chemical pulp being held at either consuming or producing points; in fact, the statistical position of the market is strong, and this leads sellers to believe that when activity revives in the paper market—as everyone has no doubt it will—papermakers will resume buying pulp on a larger scale, thus providing a ready outlet for all the supply available. No one seems to count on foreign pulps waging any great influence on the domestic market during the next few months, it being felt that importations have been at maximum within the last several weeks and that receipts of Scandinavian pulp will gradually decline from now until well into the spring. In the meantime, however, prices give promise of maintaining

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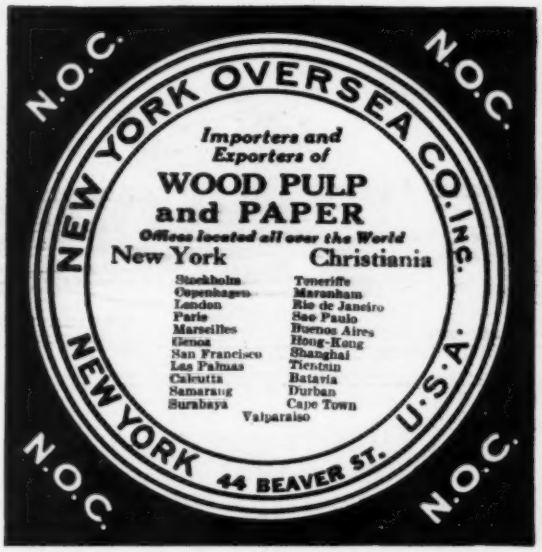
SCANDINAVIAN

PULP



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J. ROZES AINE *Agen, France*

JEAN SOULIER *Rouen, France*

LEON MOIRAND *Annonay, France*

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Largest producers in the world of highest grade Brimstone —guaranteed 99% pure—free of Arsenic and Selenium.

The UNION SULPHUR COMPANY

In so far as possible we will be glad to offer advice or suggestions to prospective buyers who are using or may be contemplating the use of brimstone.

17 BATTERY PLACE

NEW YORK

their soft tone until consumption and resultant demand increases. Quotations f. o. b. pulp mills follow:

Bleached sulphite	11.00-11.50
Easy bleaching sulphite	8.00- 8.50
News grade sulphite	7.00- 7.25
Soda pulp, bleached	7.25- 7.50
Mitscherlich unbleached	8.25- 8.75
Kraft, No. 1	5.75- 6.00
Screenings, refined	2.75- 3.00

Mechanical Pulp

There is little life to the ground wood pulp trade, and, influenced by the light demand from consuming quarters, prices have dropped to a considerable extent. Sales of domestic spruce ground wood of prime quality and freshly ground at $100 per ton and lower have been recorded, and there have been transactions in imported ground wood at a good deal under the domestic basis, purchases at $80 a ton ex the dock having been made. Offerings are not heavy as regards tonnage and producers seem to be fairly well sold up, nevertheless there are some supplies which owners have been anxious to move and such pulp has been available to reliable buyers at practically their own figures, so to speak. Grinding operations have been hampered in some sections by low water conditions, and this loss of production is one of the bullish market factors, of which there are others. A consensus of opinion among those in the selling branch of the trade is that if demand revives to anything like that prevailing not long ago, prices will go back to very nearly the levels current prior to the advent of the present slow period.

Chemicals

There is less activity in the chemical market than for some time, and the bulk of current business involves the shipment of goods against contracts, paper and pulp manufacturers doing little fresh buying while finding contract supplies ample to cover present requirements. Prices have not undergone any sharp declines although the tendency is generally downward and quotations are mostly at slightly lower levels. Prices range as follows:

Alum, lump ammonia	4.75- 5.00
Alum, lump starch	8.00- 8.50
Alum, powdered	5.50- 6.00
Blanc fixe, powdered	5.00- 5.50
Bleaching powder (domestic drums)	5.00- 5.25
Brimstone (ton)	17.00-18.00
Casein	14.50-16.50
Caustic soda, spot delivery	4.50- 4.75
China clay, domestic, washed	11.00-13.00
China clay, foreign	16.00-17.00
Rosin, grade E	11.00-
Satin white	2.50- 3.00
Soda ash, 58 per cent light (bags)	3.00- 3.50
Sulphite of alumina, commercial grade	4.50- 5.00
Starch, Globe, in bags	5.13-
Talc (ton)	16.00-18.00

Robert E. Krudener, formerly with Parsons & Whittemore, Inc., paper and paper mill supplies dealers and importers and exporters of New York, is now associated with the Lagerloef Trading Company, Inc., wood pulp importers of 18 East Forty-first street, New York.

Dr. James E. Campbell, former head of the Dexter Sulphite Pulp and Paper Company, Watertown, N. Y., which was sold several months ago to William Randolph Hearst, has arrived safely in Finland, according to word received from him by his brother, Dr. Clarence W. Campbell. Dr. Campbell and Mrs. Campbell sailed from New York October 15 to visit Finland, Norway, Sweden, Holland, Germany, Belgium, France and England.

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SOLE SELLING AGENTS
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Unbleached Sulphite 50 tons daily
Kraft Pulp 50 tons daily
Our pulp is made from Canadian Spruce
We ship in sheets, baled
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Parchment

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The Standard Utility Business Papers and the Most Widely Used Papers in the World

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NEW YORK OFFICE: 231 BROADWAY

KVP
WHY sit mournfully under a weeping willow tree and weep about the shortage of pulp wood when Luther Burbank can grow a black walnut tree two and one-half feet in diameter in sixteen years?
Kalamazoo Vegetable Parchment Company
Kalamazoo, Michigan
"World's Model Paper Mill"
Manufacturers of waxed and vegetable parchment paper.
PULP FAMINE FEARS

New Papers

Writing—		
White rag		28-50
White sulphite, No. 1		16-22
Colored		18-26
Ledger—		
White rag		28-55
White sulphite		18-27
Colored sulphite		20-28
Colored rag		30-
Bonds—		
White rag		18-50
White sulphite		16-26
Colored sulphite		18-28
Colored rag		20-
Book—		
No. 1 S. & S. C	14.00-	15.00
Machine finished	13.00-	14.00
English finished	15.00-	17.00
Coated and enameled	16.00-	18.00
Lithograph, M. F	15.00-	16.00
News Print—		
Rolls, contract	6.50-	7.00
Rolls, transient	7.00-	7.50
Sheets	8.00-	8.50
Side runs	5.50-	6.00
Cover Stock—		
Coated, both sides	12.25-	
Coated, one side	12.20-	
Wrappings—		
No. 1 kraft	11.50-	12.00
No. 2 kraft	10.50-	11.00
Boards—	New York and Chicago	
Solid news	60.00-	65.00
Straw	55.00-	60.00
Plain chip	50.00-	55.00
White coated chip	80.00-	85.00
Manila coated chip	75.00-	80.00
Binders board	120.00-	130.00

Leshner Blues

In a little booklet called Leshner Blues, which is being distributed among the paper mills by The Leshner Paper Stock Co., of Hamilton, Ohio, the remarkable growth of this company is set forth in their statement that in a little more than three years their sales have increased over one hundred fold.

It is said that their success has been the result of establishing a reputation for placing on the market rag stock that is put up better as to grading, clean packing, and uniform style of bales, and they feel that they are a great factor in clarifying general practices carried on in the rag game and do much as a means of educating the packers.

In the preparation of Thirds and Blues, ten to sixty per cent of inferior grades of rags which cannot be included in Leshner Blues are reduced to roofing rags and other special grades.

Four cost reports from their office records are reproduced in the booklet to illustrate the yield of miscellaneous packing of Thirds and Blues which are offered on the market. These records show the variety of stock included in what is known as Country Blues and how necessary it becomes to assort carefully all Blues received in order to make a standard packing.

New York dealers' average buying prices for Paper Stock and Rag Stock covering a period of ten years (1909-1919 inclusive) is shown in graphic and statistical form, and commendatory letters from a number of leading paper manufacturers are also exhibited.

Old Hickory Powder Plant Sold

The Nashville Industrial Corporation composed of business men of Nashville, Tenn., have purchased from the U. S. Government, the Old Hickory Powder Plant at Jacksonville, Tenn., located 12 miles east of Nashville, on the navigable Cumberland River. The purpose of the Nashville people is to industrially develop this immense war undertaking into a large manufacturing center, having available immense housing and manufacturing buildings and facilities. The village had a population of 35,000 when the plant was closed in 1918, and is now completely equipped with all necessary public utilities, schools, banks, club houses, etc., and offers many attractive inducements to new industries or those desiring a change in their location.

This was the largest government manufacturing undertaking during the war, costing over $87,000,000. It occupies 5,100 acres of land, has a water filtration system capable of supplying a city the size of Boston, one of the largest steam power plants in the world, a double track railroad connecting with trunk lines, 35 miles of industrial track connecting manufacturing buildings, an immense refrigeration system, complete water works, sewerage system, fire departments, concrete and macadam roads. A great quantity of surplus material in the manufacturing area will be dismantled and sold.

Makes First Paper Machine

The first paper machine ever turned out by the Valley Iron Works, Appleton, Wisconsin, is ready for shipment to the H. W. Johns-Manville plant at Manville, New Jersey. It is a five-cylinder roofing paper machine. Five cars will be required to transport it to the eastern plant. Fourteen carloads of the "dry" section of the machine was shipped in September. Complete, the outfit weighs 400 tons and will be 225 feet long when erected. The machine contains 60 driers, 36 inches in diameter by 80 inches wide. It will turn out 50 tons of roofing paper daily.

A stuff pump capable of supplying fifty tons of material to the machine was made at the shops, too.

This is the first paper machine made in the state outside of Beloit. The company is preparing now to build another machine for the same firm.

A. H. Labisky, who has been purchasing agent at the University of Wisconsin, has accepted a similar position with the Northern Paper Mills of Green Bay, Wisconsin. A purchasing department has just been added to the Northern offices.

The Great Western Paper Company of Ladysmith, Wisconsin, has signed a contract to furnish fifteen tons of paper a day for the next five years to the Chicago telephone directory.

30 Years Exporting American Paper

Our Markets: The World outside of U. S. A. and Canada.

Our Organization: Ten selling offices, besides salaried travellers and local representatives.

Our Demand: An established clientele, constantly being increased, by an aggressive sales policy.

Our Supply: **Your Mill?**

Present conditions in America are temporary.

Have you considered what a first-class export outlet would mean to you, with its assurance of steady demand?

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WE have a selling capacity twice our supply, and are in the market for paper in large volume, and would like to hear from you.

Our competent selling organization has from the beginning always demanded an ever increasing supply. We are at present all sold up and looking around for more, and are now in the market for five thousand tons in several grades.

We would be glad to hear from you what tonnage you can give us during this year. Write us.

Interstate Pulp & Paper Co., Inc.
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Have You Tried Cotton Linters for Paper Stock?

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Our organization covers the South

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Write or Wire for Samples and Quotations

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Main Office Dallas, Texas
Chicago Office 64 W. Randolph St.

Chemical Pulp

As is customary at about this time of the year, importations of wood pulp from Scandinavia, and especially Sweden, have been comparatively large in recent weeks, this being the season when shippers on the other side rush out all the supply they can in an effort to move stocks prior to the freezing of the Baltic. Coming at just a juncture when paper mills in the United States have slowed down because of business depression, the increased offerings of foreign pulp have naturally weakened the market situation to some extent although it can be said that prices generally are holding moderately steady, no sharp declines having occurred in any grade of pulp. Authoritative advices from primary sources are to the effect that producers in Scandinavia, as well as in Finland and Germany, have no heavy tonnages of wood pulp to sell. Production in Europe has been necessarily curtailed for some time by conditions surrounding coal, sulphur and other raw materials, and most manufacturers on the other side contracted several months ago for the bulk of their output during the balance of this year. There seems no danger therefore of any sizable quantities of pulp being "dumped" into the United States or of the market becoming flooded with excessive supplies. Importers as a rule are still following a safe policy and are mainly confining their operations to absorbing supplies on firm orders from paper mill customers here. There has been some pulp shipped to the American market apparently on consignment but scarcely enough to materially affect the market. Such recession as has occurred in prices have been due more to the lack of demand from consumers than to heavy stocks.

A feature of our import trade in wood pulp recently has been the receipt of relatively large tonnages of ground wood from foreign countries. Most of this pulp has found a ready sale notwithstanding that its quality is below that of domestic mechanical pulp, board mills having purchased the bulk of it. Prices on ground wood, however, have dropped proportionately further than have those on chemical pulp, and the probabilities are less mechanical pulp will be imported at the present market basis of prices.

There is some supply of bleached sulphite available at around 12.50 cents per pound ex dock, with quotations ranging up to 13 cents. Unbleached sulphite of No. 1 quality is quoted at 8.50 to 9 cents, foreign easy bleaching sulphite at 9 to 9.50 cents, unbleached Mitscherlich sulphite at 9.50 to 10 cents and kraft pulp at 6.25 cents. Imported ground wood is offering at $85 per ton or slightly less ex the dock. Receipts at the port of New York during November and current quotations on an ex dock basis follow:

Bleached sulphite	$12.50-13.00
Unbleached sulphite, No. 1	8.50- 9.00
Easy bleaching	9.00- 9.50
Mitscherlich unbleached	9.50-10.00
Kraft	6.00- 6.25
Ground wood, per ton	80.00-85.00

New York Oversea Co., 3,100 bls. from Kobe; Mitsui & Co., 1,191 bls. from Kobe; Irving National Bank, 16,247 bls. from Kotka, Finland; E. & S. Jeb Co., 245 bls. from Halifax; Castle, Gottheil & Overton, 600 bls. from Danzig; National Bank of Commerce, 600 bls. from Danzig, 11,476 bls. from Rotterdam; Guaranty Trust Co., 540 bls. from Danzig; A. J. Pagel & Co., 5,400 bls. from Donajo; Scandinavian-American Trading Co., 2,275 bls. from Gothenburg, 2,400 bls. from Donajo; American Woodpulp Corp., 800 bls. from Donajo; E. M. Sergeant & Co., 160 bls. from Christiania, 595 bls. from Gothenburg; J. Andersen & Co., 3,000 bls. from Christiania, 130 bls. from Trieste; J. F. Patton & Co., 4,900 bls. from Gothenburg; Corin Bros., 875 bls. from Gothenburg; M. Gottesman & Co., 1,000 bls. from Gothenburg; W. Schall & Co., 300 bls. from Gothenburg; Parsons & Whittemore, 351 bls. from Vancouver; Order, 10,220 bls. from Trondhjem, 1,980 bls. from Danzig, 2,175 bls. from Rotterdam; 21,300 bls. from Donajo; 10,090 bls. from Gothenburg, 6,300 bls. from Christiania.

Paper Stock

Importations of papermaking material in November were doubtless of smaller volume than for any month previous for a year or longer. The reasons for this are several, chief of which is the condition of the consuming market in this country. With paper manufacturers using at present far less than normal amounts of raw material, they are consequently buying less, and prices on rags, ropes, baggings and other goods have sunk to levels where there is scant profit in bringing into the country most grades of these materials from foreign sources. Importers are taking such supplies as they contracted for several months ago and are doing very little fresh purchasing in Europe. Prices abroad have declined in most cases but not enough to offset the recession in values in the United States. However, indications are that if consumers find need for foreign material they can obtain supplies without difficulty by paying slightly better prices than now prevail. Stocks in European countries, according to most advices, are ample for domestic requirements with a good surplus available for export. Receipts at New York during November were as follows:

Old Rope

Old Colony Trust Co., 64 coils from Bristol; United Fruit Co., 21 coils from Bristol; E. J. Keller Co., 80 coils from Hull; Guaranty Trust Co., 175 coils from Copenhagen.

Old Bagging

Ladenburg, Thalman & Co., 191 bls. from Antwerp; National City Bank, 289 bls. from Copenhagen; International Banking Corp., 236 bls. from Manchester; Schulz & Ruckgaber, 181 bls. from Manchester; Mente & Co., 134 bls. from Manchester; Order, 20 bls. from Antwerp.

Rags

Castle, Gottheil & Overton, 721 bls. from Bordeaux, 539 bls. from Havre, 200 bls. from Rotterdam, 300 bls. from London; Atterbury Bros., 197 bls. from Havre; A. Katzenstein, 321 bls. from Havre; Edwin Butterworth & Co., 193 bls. from Havre; E. Gross & Co., 50 bls. from Rotterdam; E. J. Keller Co., 273 bls. from Rotterdam, 471 bls. from London; M. Frank, 225 bls. from Rotterdam; Gatti-McQuade Co., 52 bls. from Rotterdam; Main Paper Stock Co., 166 bls. from Rotterdam, 52 bls. from Antwerp, 271 bls. from London; Wilkinson Bros. & Co., 129 bls. from Rotterdam, 273 bls. from London; Albion Trading Co., 78 bls. from Southampton; Excel Remnants Co., 41 bls. from Rotterdam; W. Van Doorn, 2 bls. from Rotterdam; Gotham Paper Stock Co., 8 bls. from Liverpool; Salomon Bros. & Co., 40 bls. from London; D.

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Porcelain, Peninsular and Purity Enamel Book

M.F. and S&SC Book and Catalog

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Coated Blanks
Post Card Translucent

Vanderberg, 48 bls. from London; National City Bank, 99 bls. from Havre, 59 bls. from Hull, 173 bls. from Antwerp; Mechanics & Metals National Bank, 268 bls. from Nantes, 94 bls. from Havre, 80 bls. from Antwerp; Chemical National Bank, 98 bls. from Copenhagen; Hettleman, Burshain & Co., 14 bls. from Liverpool; Ladenburg, Thalman & Co., 151 bls. from Hamburg, 517 bls. from Antwerp; W. Schall & Co., 285 bls. from Antwerp; Brown Bros. & Co., 71 bls. from Belfast; Goldman, Sachs & Co., 210 bls. from Antwerp; Bank of the U. S., 47 bls. from Antwerp; Equitable Trust Co., 401 bls. from Antwerp; R. F. Downing & Co., 180 bls. from Antwerp, 221 bls. from London; Order, 20 bls. from Liverpool, 10 bls. from Manchester.

Miscellaneous Paper Stock

E. J. Keller Co., 261 bls. from Rotterdam; Castle, Gottheil & Overton, 1,035 bls. from Rotterdam, 125 bls. from Belfast, 310 bls. from London; Ewin Butterworth & Co., 505 bls. from Belfast; Main Paper Stock Co., 309 bls. from Rotterdam; Wilkinson Bros. & Co., 117 bls. from Rotterdam; M. Frank, 55 bls. from Rotterdam; Guaranty Trust Co., 35 bls. from Liverpool, 97 bls. from Glasgow; Equitable Trust Co., 8 bls. from Glasgow, 144 bls. from Antwerp; Irving National Bank, 130 bls. from Belfast; American Exchange National Bank, 77 bls. from Belfast; Foreign Trade Banking Corp., 42 bls. from Rotterdam; W. Schall & Co., 7 bls. from Antwerp; Order, 138 bls. from London.

Paper

News print from Scandinavia and Germany, straw board from Germany and cigarette paper from France constitute the bulk of paper being imported into the United States at the present time from European sources. Occasional shipments of news print of fairly large tonnage are being received, yet importations of this class of paper do not commence to approximate the quantity claimed in some quarters. Probably the feature of our import paper trade during the past month has been the amount of straw board brought in from Germany. Board concerns in a number of instances have sent representatives across the Atlantic for the especial purpose of buying up supplies, and apparently quite a tonnage of board has been absorbed for shipment to the American market. With prices on domestic boards where they are now, it is questionable whether this business will be continued, however. Cigarette paper importations are close to normal, while special grades of wrapping, writing, hanging and filter papers are also being imported. Arrivals at the port of New York during November were:

Cigarette

R. J. Reynolds Tobacco Co., 730 cs. from Bordeaux; Knauth, Nachod & Kuhne, 6 cs. from Rotterdam; P. J. Schweitzer, 146 cs. from Genoa; American Tobacco Co., 166 cs. from Havre, 500 cs. from Bordeaux; Surbrug Co., 24 cs. from Havre; W. Duke & Sons, 20 cs. from Havre; Rose & Frank Co., 16 cs. from Havre; Wilkinson Bros. & Co., 15 cs. from Havre; Schmidt & Co., 30 cs. from Barcelona; Southern Pacific Co., 3 cs. from Havre; Order, 3 cs. from Constantinople.

Printing

B. F. Drakenfeld & Co., 124 cs. from Liverpool; Equitable Trust Co., 673 rolls from Hamburg; Columbia Trust Co., 2,236 rolls from Rotterdam; Oxford University Press, 6 cs. from Liverpool; Irving National Bank, 116 bls. from Danzig; New York American, 3,100 rolls from Gothenburg; J. Schmidt, Inc., 2 cs. from Havre; American Express Co., 1,461 rolls from Hamburg; Philadelphia National Bank, 51 rolls from Hamburg; Globe Shipping Co., 107 cs. from Hamburg, 17 cs. from Rotterdam; Guaranty Trust Co., 79 cs. from Rotterdam; J. L. Smythe & Co., 272 cs. from Rotterdam;

Mill Agents and Dealers

All Grades of Paper and Board

Agents for The Riverton Paper Company, Inc., Riverton, Conn. Manufacturers of light weight specialties.

Ground Wood and Chemical Pulp

STATE PULP & PAPER COMANY, Inc.
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Alum
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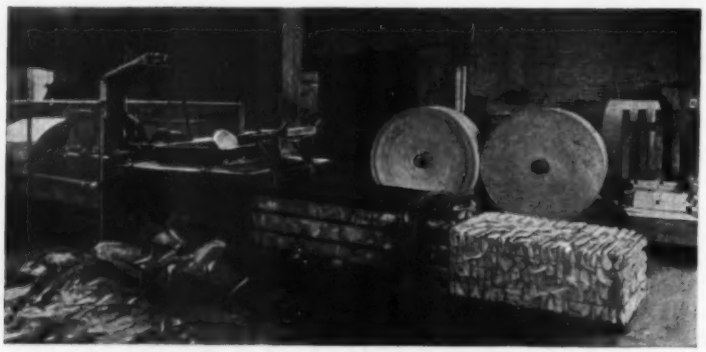
The Pulp and Paper Trading Co.
21 East 40th Street New York City
Dealers in Domestic Chemical and Mechanical Pulps and Paper

AGENTS FOR
J. & J. Rogers Company, Au Sable Forks, N. Y.
Canadian Kraft, Ltd.
Dealers in Wayoganiack Kraft
Three Rivers, Canada

EASTERN AGENTS FOR
Port Huron, Michigan, Sulphite
Made by Port Huron Sulphite & Paper Co., Port Huron, Mich.

THE "FAMOUS OHIO" BALING PRESS

"Judged by the Companies it Serves"



"The best on the market" is the way the National Carton Co. describes the Famous Ohio. This shows one operating in their plant at Joliet, Ill.

FAMOUS Ohio BALING PRESS

You should judge the Famous Ohio by the companies it serves, and by what they say about it.

Among the users of the Famous Ohio are the Eastman Kodak Co., John Wanamaker, and the publishers of the Saturday Evening Post.

They say such things as this: "We have found this baler to give absolute satisfaction under very trying conditions. We started with one and have increased our number to five, which we feel is a good recommendation in itself." Another says: "We find that one man can do the work of two and in about one-quarter of the time."

The Famous Ohio is the leading baler for all compressible materials.

Our new illustrated Baling Press catalog will be sent on request

The Ohio Cultivator *Co.*
Bellevue, Ohio

FOURDRINIER WIRES

Dandy Rolls *Cylinder Molds*
Brass, Copper and Iron Cloth
Bank and Office Railings

WIRE SIGNS

Cheney Bigelow Wire Works
Established 1842 SPRINGFIELD, MASS.

Progreso Italiano Americano, 194 rolls from Gothenburg; J. F. Patton & Co., 1,016 rolls and 226 pkgs. from St. Johns, N. F.; Agar Bernson Corp., 679 rolls from Rotterdam; Order, 16 rolls from Hamburg, 1,238 rolls from Donajo, 172 rolls from Stockholm, 663 rolls from Copenhagen.

Hanging

A. C. Dodman, Jr., 49 bls. from Liverpool; American Express Co., 1,753 rolls from Hamburg; R. F. Downing & Co., 9 bls. from London; W. H. S. Lloyd & Co., 16 cs. from London, 1 cse. from Liverpool; Emmerich & Co., 4 cs. from Havre; A. Murphy & Co., 3 bls. from Liverpool; Order, 9 cs. from London.

Wrapping

Birn & Wachenheim, 236 bls. from Rotterdam; Chemical National Bank, 102 bls. from Hamburg; United Fruit Co., 216 rolls from Gothenburg; Equitable Trust Co., 64 cs. from Rotterdam; Order, 170 bls. from Hamburg, 18 bls. from London.

Writing

American Export Paper Co., 2 cs. from Curacao; Rikkers Bros., 16 cs. from Rotterdam, 2 cs. from Liverpool; W. J. Byrnes & Co., 2 cs. from Havre; J. W. Hampton, Jr., & Co., 7 cs. from Hamburg; Van Oppen & Co., 6 cs. from London; Meadows, Wye & Co., 3 cs. from Liverpool, 1 cse. from London; A. Flinn & Co., 4 cs. from Havre; Order, 2 bls. from London.

Filter

T. S. Todd & Co., 15 cs. from Bordeaux; M. Weiss & Co., 54 bls. from Bordeaux; E. M. Sergeant & Co., 2 cs. from Gothenburg; Druggist Supply Co., 35 cs. from Bordeaux.

Boards

Phoenix Shipping Co., 2,005 bls. from Rotterdam, 23 cs. from Hamburg; A. Harder & Boesberg, 21 cs. from Hamburg; Bendix Paper Co., 24 cs. from Hamburg; Guaranty Trust Co., 412 rolls from Rotterdam, 850 bls. from Danzig; Pulp & Paper Trading Co., 346 rolls from Rotterdam; Star Corrugated Box Co., 590 rolls from Rotterdam; Columbia Corrugated Co., 584 rolls from Rotterdam; Prager Co., 20 cs. from Hamburg; Knauth, Nachod & Kuhne, 11 cs. from Hamburg; Riegel & Co., 321 rolls from London, 922 rolls from Rotterdam; Chatham & Phenix National Bank, 216 rolls from Rotterdam; Globe Shipping Co., 6 cs. from Hamburg; E. Mouquin, 13 cs. from Havre; A. H. Rinck & Co., 3 cs. from Rotterdam; C. B. Hewitt & Bros., 2,400 pkgs. from Rotterdam; Order, 347 rolls from Rotterdam.

Drawing

M. Winter, 10 cs. from Hamburg; Meadows, Wye & Co., 10 cs. from London.

Miscellaneous

W. Schall & Co., 77 cs. from Hamburg; Lunham & Moore, 304 pkgs. from Bordeaux; A. Frankan & Co., 4 cs. from Hamburg; Inwall Glass Co., 150 rolls from Hamburg; Lindt Chocolate Co., 15 cs. from Rotterdam; Lagerloef Trading Co., 10 rolls from Rotterdam; Keuffel & Esser Co., 16 cs. from Rotterdam; N. Y. Label & Box Works, 14 cs. from Rotterdam; W. Van Doorn, 30 bls. from Rotterdam; New York Oversea Co., 203 cs. from Melbourne; S. Chiles, 600 bls. from Genoa; J. F. Patton & Co., 1,272 rolls and 2,942 bls. from Halifax; Canson & Montgolfer, 5 cs. from Havre; Gimbel Bros., 5 cs. from Havre; Irving National Bank, 9 cs. from Buenos Aires, 33 cs. from Antwerp, 8 cs. from Havre; Butterick Publishing Co., 7 cs. from Buenos Aires; American Express Co., 12 cs. from Danzig, 4 cs. from Antwerp; Wilkinson Bros. & Co., 147 bls. from Antwerp; Japan Paper Co., 4 cs. from Antwerp, 119 cs. from Genoa; H. Kayser Sons, 16 cs. from Havre; C. B. Richard & Co., 6 cs. from Christiania; G. Dahlen, 2 cs. from Gothenburg; Dalton Adding Machine

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GENERAL MACHINE WORK

HIGH SPEED BELTING

VOORHEES RUBBER M'F'G CO

VOORHEES SENSATION

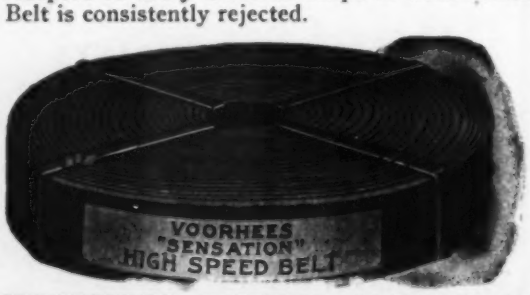
APTLY NAMED, as it may be,

"Sensation" Belting is not an accidental discovery.

NOTHING ORDINARY OCCURS IN ITS MAKE-UP.

The approaches to this type are a few, maybe, but **none have arrived** at such stage of compounding and constructive **perfection.**

Adapted to **every** drive its scope is wide—belongs where Leather isn't just right and where Rubber Belt is consistently rejected.



"SENSATION" stands unmatched
In tensile strength.
Flexible, compact, inseparable plies.
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Home of "Rub-Steel"—"The Valve with a Backbone" *New York Office, 30 Reade Street*

Co., 16 cs. from Copenhagen; P. Puttmann, 242 cs. from Antwerp; National City Bank, 316 bls. from Antwerp, 3,883 cs. from Bordeaux; Foreign Trade Banking Corp., 3,600 pkgs. from Hamburg; Henry Lindenmeyr & Sons, 333 cs. from Rotterdam; L. A. Consmiller, 62 cs. from Rotterdam; Habirshaw Electric Cable Co., 1,842 rolls from Gothenburg; Baldwin Universal Consolidated Co., 16 cs. from Rotterdam; Black, Starr & Frost, 2 cs. from Havre; Funch, Edye & Co., 8 cs. from Havre; Snows, Ltd., 2 cs. from Havre; Chase National Bank, 25 cs. from Hong Kong; Schulz & Ruckgaber, 10 cs. from Hong Kong; E. Bennecke & Co., 25 cs. from Hong Kong; Guaranty Trust Co., 15 cs. from Hong Kong; Order, 13 cs. from London, 37 bls. from Sydney.

Foreign Trade Opportunities

A Government office in Poland is in need of machines for the manufacture of cigarette boxes, also cardboard, wrapping paper, cigarette paper in rolls, mouthpiece paper and other paper. Offers, accompanied by samples and illustrated catalogues, should be forwarded. Payment will be made upon delivery with letter of credit. For further data those interested should communicate with the Bureau of Foreign and Domestic Commerce, Washington, D. C., referring to Inquiry No. 33985.

A candle manufacturer in Chile wishes to secure catalogues and price lists from manufacturers of machinery for wrapping candles in packages. Cash to be paid. Reference. For further data those interested should communicate with the Bureau of Foreign and Domestic Commerce, Washington, D. C., referring to Inquiry No. 33996.

The representative of a trading corporation in Chile is in the United States and desires to secure an agency for the sale of paper. Reference. For further data those interested should communicate with the Bureau of Foreign and Domestic Commerce, Washington, D. C., referring to Inquiry No. 33973.

A sales-agency firm in Honduras desires to secure the representation of manufacturers for the sale of all kinds of wrapping paper, paper bags, ribbed cigarette paper in sheets, foolscap paper, etc. References. For further data those interested should communicate with the Bureau of Foreign and Domestic Commerce, Washington, D. C., referring to Inquiry No. 34032.

A manufacturer in Italy desires to be placed in communication with manufacturers of machines for cutting and shaping of cartons 3¾ by 1¼ inches. A sample carton was forwarded and may be examined at the Bureau or its district offices. (Refer to miscellaneous file No. 218.) No reference offered. Correspondence should be in Italian. For further data those interested should communicate with the Bureau of Foreign and Domestic Commerce, Washington, D. C., referring to Inquiry No. 34033.

Neenah may get the first state papermaking school in Wisconsin. Such a school is now being contemplated by the state vocational school system. It would be open to ex-service men only, according to the plan approved. A class in papermaking is now being tried out in the Neenah high school.

The Dells Paper and Pulp Company which has control of the Chippewa river dam at Eau Claire, Wisconsin, for a period of 99 years has proposed to the city that three changes be made—repairs, replacing the present dam with a concrete structure, and erection of a new concrete dam with a 32-inch head in place of the present one of 26 inches in the wooden structure. The city council is thinking it over.

WANTED

Experienced Machine Tenders and Back Tenders on Yankee Paper Machine. Address P. O. Box 25, care of The Paper Industry

If you manufacture a product used extensively in the paper industry, and which could be sold to advantage in the State of Ohio,

Address Box 21,
The Paper Industry.

Wanted

Additional capital by small wrapping paper mill. Would prefer to have practical paper maker become interested.

Address Box 24 The Paper Industry

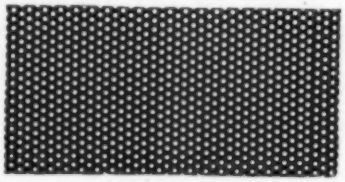
Wanted

1 night foreman, 3 first class machine tenders, 3 first class Beater Engineers, 3 first class Backtenders on 108", 6 cylinder machine running on container board. 8 hour shift. First class wages to **good men.** Kindly address P. O. Box 23, Care Paper Industry.

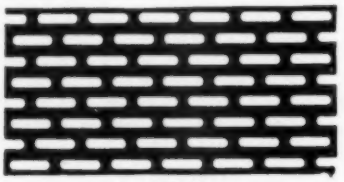
For Sale

14 Noble and Wood 1800 lb. Beaters—roll 72" x 44"—condition good. For further information apply The Stamsocott Company, Hopewell, Virginia.

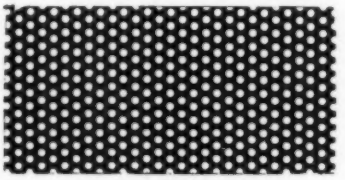
Perforated Metal Screens for Pulp and Paper Mills



.065 inch round



⅛ x ½" Slots



3/32 inch round

Steel, Copper, Brass, Bronze and other alloys punched for Centrifugal and Rotary Screens, Pulp Washers, Drainer Bottoms, Filter Plates, etc.

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Boxboard and Newsboard Mill—50 tons capacity.

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Wrapping Mills, Kraft, Manila, Bogus, Textile and High Grade Wrappings.

Tissue Mills, Toilet, Crepe, Twisting and Copying—5 to 15 tons capacity.

Book, Writings and Ledger Mill—10 tons capacity.
Leather and Fibre Board Mills—5 and 10 tons capacity.
Felt Roofing Mill—10 tons capacity.

Specialty Paper Mills—Onion Skin, Water Finished Papers, Etc.

Ground Wood Mill.

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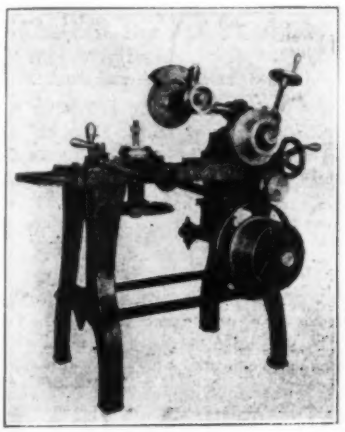

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Buyers' Guide—What and Where to Buy

Equipment, Apparatus, Supplies and Raw Materials Used by the Paper Industry

ADHESIVES
E. F. Russ Co., 201 Devonshire St., Boston, Mass.

ACID RESISTING BRONZE
Sandusky Foundry & Machine Co., Sandusky, Ohio.
William A. Hardy & Sons, Fitchburg, Mass.

ACID RESISTING PAINT
Detroit Graphite Co., 503 12th St., Detroit, Mich.

AGITATOR EQUIPMENT
The Hill Clutch Co., Cleveland, Ohio.
Moore & White Co., Philadelphia, Pa.

AIR CONDITIONING AND CONTROL APPARATUS
American Blower Co., Detroit, Mich.
Bayley Mfg. Co., 732 Greenbush St., Milwaukee, Wis.

ALKALI
Diamond Alkali Co., Pittsburgh, Pa.
Wing & Evans, 22 William St., N. Y. C.

ANGLE VALVES
The Crane Company, Chicago, Ill.

ARCHITECTS
James L. Carey, 208 N. Laramie St., Chicago.
Hardy S. Ferguson, 200 Fifth Ave., New York City.
George F. Hardy, 309 Broadway, New York City.

ASH CONVEYORS
L. S. Shaw & Co., 5716 Euclid Ave., Cleveland, O.

ASH HANDLING SYSTEMS
R. H. Beaumont, Philadelphia, Pa.

ASSORTING TABLES
Moore and White Co., Philadelphia, Pa.

AUDITORS
Morris Rosenblum, 51 Liberty St., N. Y. C.

AUTOMATIC COOKING CONTROL
Trimbey & Allen, Glens Falls, N. Y.

AUTO TRUCKS
The White Co., Cleveland, O.

BALING PRESSES
Ohio Cultivator Co., Belleville, O.

BARKERS
Carthage Machine Co., Carthage, N. Y.
Holyoke Machine Co., Holyoke, Mass.
Union Iron Works, Bangor, Me.
Valley Iron Works Co., Appleton, Wis.

BARK SHREDDERS
The Jeffrey Mfg. Co., Columbus, O.

BEATER BARS
John W. Bolton & Sons, Inc., Lawrence, Mass.
Simonds Manufacturing Co., Fitchburg, Mass.

BEATER BED PLATES
John W. Bolton & Sons, Inc., Lawrence, Mass.
Simonds Manufacturing Co., Fitchburg, Mass.

BEATER ROLL FILLING
John W. Bolton & Sons, Inc., Lawrence, Mass.
Simonds Manufacturing Co., Fitchburg, Mass.

BEATING, WASHING AND BLEACHING ENGINES
Dayton Beater & Hoist Co., Dayton, Ohio.
Holyoke Machine Co., Holyoke, Mass.
Noble & Wood Machine Co., Hoosick Falls, N. Y.
Valley Iron Works Co., Appleton, Wis.

BEATERS (Continuous)
Claflin Engineering Co., Lancaster, Ohio.
The Griley-Unkle Eng. Co., Ft. Wayne, Ind.
Bird Machine Co., East Walpole, Mass.

BELTING (Leather)
The Cleveland Oak Belting Co., 1239 W. 9th St., Cleveland, O.

BELTING (Rubber)
Voorhees Rubber Co., Jersey City, N. J.

BELT CONVEYORS
The Jeffrey Mfg. Co., Columbus, O.
Robins Conveying Belt Co., New York City.

BELT FASTENERS
Crescent Belt Fastener Co., 381 Fourth Ave., New York City.

BELT DRESSING
G. B. Stock Xylite Grease & Oil Co., Port Huron, Mich.

BELT DRIVES
The Hill Clutch Co., Cleveland, Ohio.
The Link Belt Co., Chicago, Ill.

BLEACHING POWDER
Michigan Electrochemical Co., Menominee, Mich.
Pennsylvania Salt Mfg. Co., Philadelphia.

BLEACHING (Propellers)
Moore and White Co., Philadelphia, Pa.

BLOWERS
American Blower Co., Detroit, Mich.
Bayley Mfg. Co., 732 Greenbush St., Milwaukee, Wis.

BOARD MACHINES
Beloit Iron Works, Beloit, Wis.
Valley Iron Works, Appleton, Wis.

BOARDS (Straw)
The C. L. La Boiteaux Co., Cincinnati, O.

BOILERS
J. F. Davis, Chicago.

BOILER ARCHES
L. S. Shaw & Co., 5716 Euclid Ave., Cleveland, O.

BOILER BAFFLES
L. S. Shaw & Co., 5716 Euclid Ave., Cleveland, O.

BOILER FEEDER
The Farnsworth Co., Conshohocken, Pa.

BOILER FEED REGULATOR
Northern Equipment Co., 104 W. 11th St., Erie, Pa.

BOILER SETTINGS
McLeod & Henry Co., Troy, N. Y.

BRASS WIRE CLOTH
Appleton Wire Works, Appleton, Wis.
Cheney Bigelow Wire Works, Springfield, Mass.
Lindsay Wire Weaving Co., Cleveland, Ohio.
W. S. Tyler Co., Cleveland, Ohio.
Wisconsin Wire Works, Appleton, Wis.

BROKERS & FORWARDING AGENTS
Parsons Trading Co., 17 Battery Place, N. Y. C.

BRIMSTONE
Union Sulphur Co., 17 Battery Place, New York City.

BRONZE CASTINGS
Eastwood Wire Mfg. Co., Columbus, O.

BRONZE JACKETS
Sandusky Foundry & Machine Co., Sandusky, Ohio.

BUNDLING SYSTEMS
Signode System, Lake St., Chicago

CALENDERS
Beloit Iron Works, Beloit, Wis.
Holyoke Machine Co., Holyoke, Mass.

CALENDER DOCTORS
Ticonderoga Machine Works, Ticonderoga, N.Y.

CALENDER ROLLS
Holyoke Machine Co., Holyoke, Mass.
B. F. Perkins and Son, Inc., Holyoke, Mass.

CASEIN
J. A. & W. Bird & Co., 88 Pearl St., Boston, Mass.
The Kalbfleisch Corp., 31 Union Square, N. Y. C.

CAST IRON PIPE
U. S. Cast Iron Pipe & Foundry Co., Burlington, N. J.
Cast Iron Publicity Bureau, New York City.
Glamorgan Pipe & Foundry Co., Lynchburg, Va.

CAUSTIC SODA
Diamond Alkali Co., Pittsburgh, Pa.

CAUSTICIZING APPARATUS
Glamorgan Pipe & Foundry Co., Lynchburg, Va.

CENTRIFUGAL PUMPS
American Steam Pump Co., Battle Creek, Mich.
Buffalo Steam Pump Co., Buffalo, N. Y.
Glens Falls Machine Works, Glens Falls, N. Y.
Manistee Iron Works Co., Manistee, Mich.
Valley Iron Works Co., Appleton, Wis.

CHAIN BLOCKS
Yale & Towne Mfg. Co., Stamford, Conn.

CHEMICALS
Eastern Paper Makers' Chemical Co., Watertown, N. Y.
The Grasselli Chemical Co., Cleveland, Ohio.
A. Klipstein & Co., 644 to 652 Greenwich St., New York City.
Paper Makers' Chemical Co., Easton, Pa., and Holyoke, Mass.
Mathieson Alkali Works, Inc., New York City.
Western Paper Makers' Chemical Co., Kalamazoo, Mich.

CHIP CRUSHERS
Carthage Machine Co., Carthage, N. Y.

CHIPPERS
Holyoke Machine Co., Holyoke, Mass.
Union Iron Works, Bangor, Me.
Valley Iron Works Co., Appleton, Wis.

CHIPPER AND BARKER KNIVES
John W. Bolton & Sons, Inc., Lawrence, Mass.
Simonds Manufacturing Co., Fitchburg, Mass.

CHIP SCREENS
Carthage Machine Co., Carthage, N. Y.

CLAYS AND FILLERS
Binney & Smith Co., 81 Fulton St., N. Y. C.
J. A. & W. Bird & Co., 88 Pearl St., Boston, Mass.
Daniel M. Hicks, 200 Fifth Ave., New York City.
Eastern Paper Makers' Chemical Co., Watertown, N. Y.
English China Class Sales Corp., 33 West 42nd St., New York City.
International Pulp Co., 41 Park Row, N. Y. C.
Miner-Edgar Co., 110 William St., N. Y. C.
Paper Makers' Chemical Co., Easton, Pa., and Holyoke, Mass.
R. T. Vanderbilt Co., 50 E. 42nd St., New York City.
Western Paper Makers' Chemical Co., Kalamazoo, Mich.

COAL BUNKERS
R. H. Beaumont Co., Philadelphia, Pa.
The Brownhoist Co., Cleveland, Ohio.
The Jeffrey Mfg. Co., Columbus, O.

COAL STORAGE SYSTEMS
R. H. Beaumont Co., Philadelphia, Pa.

COAL & ASH HANDLING SYSTEMS
R. H. Beaumont Co., 394 Arch St., Philadelphia, Pa.
Godfrey Conveyor Co., 119 13th St., Elkhart, Ind.
The Jeffrey Mfg. Co., Columbus, O.

COATED PAPERS
Bardeen Paper Co., Otsego, Mich.
Bermingham & Prosser, Chicago, Ill.
Seaman Paper Co., Chicago, Ill.

COMBUSTION ENGINEERS
Automatic Fuel Saving Co., Chicago.

CONSISTENCY REGULATOR
Trimbey & Allen, Glens Falls, N. Y.

CONSTRUCTION (Building)
Casper Ranger Construction Co., Holyoke, Mass.

CONSULTING ENGINEERS
James L. Carey, 208 N. Laramie St., Chicago, Ill.
Hardy S. Ferguson, 200 Fifth Ave., New York City.
George F. Hardy, 309 Broadway, New York City.

CONSULTING ENGINEERS (Power)
J. F. Carrigan Engineering Co., 504 Cunard Bldg., Chicago.

CONTROLLERS
Northern Equipment Co., Erie, Pa.

CONTROLLERS (Boiler Feed)
Northern Equipment Co., Erie, Pa.

CONTROLLERS (Feed Water)
Northern Equipment Co., Erie, Pa.

CONVEYORS
Godfrey Conveyor Co., 119 13th St., Elkhart, Ind.
The Jeffrey Mfg. Co., Columbus, O.
Link-Belt Co., Chicago, Ill.
Portable Machine Co., Passaic, N. J.
Robins Conveying Belt Co., New York City.

CONVEYORS (Coal and Ash)
R. H. Beaumont Co., Philadelphia, Pa.

COTTON LINTERS
Dallas Waste Mills, 130 Pearl St., New York City.
Steele By-Products Co., Chicago.

CRANES
The Brownhoist Co., Cleveland, Ohio.
John F. Byers Co., Ravenna, Ohio.
Euclid Crane & Hoist Co., Cleveland, Ohio.
Northern Engineering Works, Detroit, Mich.
The Chisholm-Moore Mfg. Co., Cleveland, O.
The Link Belt Co., Chicago, Ill.

CRUSHERS (Coal)
The Jeffrey Mfg. Co., Columbus, O.

CYLINDER MOLDS
Appleton Wire Works, Appleton, Wis.
Beloit Iron Works, Beloit, Wis.
Cheney Bigelow Wire Works, Springfield, Mass.
Eastwood Wire Mfg. Co., Belleville, N. J.
Glens Falls Machine Works, Glens Falls, N. Y.
The Lindsay Wire Weaving Co., Cleveland, O.
The W. S. Tyler Co., Cleveland, Ohio.

DANDY ROLLS
Appleton Wire Works, Appleton, Wis.
Central Mfg. Co., Kalamazoo, Mich.
Cheney Bigelow Wire Works, Springfield, Ohio.
Eastwood Wire Mfg. Co., Belleville, N. J.
Lindsay Wire Weaving Co., Cleveland, Ohio.
The W. S. Tyler Co., Cleveland, Ohio.

DECKEL FRAME SUPPORTS
Husband & Nash, Menasha, Wis.

DIGESTORS
The M. W. Kellogg Co., 90 West St., New York City.

DRUM WINDERS
Beloit Iron Works, Beloit, Wis.
Ticonderoga Machine Co., Ticonderoga, N. Y.

DRYER FELTS
Albany Felt Co., Albany, N. Y.
Appleton Woolen Co., Appleton, Wis.
Fitchburg Duck Mills, Fitchburg, Mass.
F. C. Huyck & Sons.
Shuler and Benninghofen, Hamilton, Ohio.

DYNAMOS
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.

The Sandy Hill Iron & Brass Works

Hudson Falls
New York

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Surplus stock taken over from the Du Pont Chemical Co. and other plants.

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Used Six Months to Three Years
Offered Subject to Any Inspection

No.	Size, Hp.	Make	Pressure, Lb.
9	600	Edge Moor (Ohio Standard)	200
13	600	Edge Moor	200
20	600	Edge Moor	160
1	813	Edge Moor (A. S. M. E.)	200
Above located in du Pont Chemical Company's Plant at Hopewell, Virginia			
2	295	B. & W. (Stirling) located Carney's Point, N. J.	200
5	253	Stirling Class E No. 22	160
2	264	B. & W.	160
10	512	Stirling Class S No. 26	160
2	512	Stirling Class S No. 26	160
1	823	Stirling M-30 (A. S. M. E.)	200
2	550	Edge Moor	150
2	238	Edge Moor	150
1	231	Edge Moor (Ohio Standard)	150
1	199	Edge Moor	150
1	100	Smith HRT	100
1	50	Ames Locomotive	100
Above boilers located at du Pont Chemical Company's Plant, Carney's Point, N. J.			

MISCELLANEOUS

No.	Size, Hp.	Make	Pressure, Lb.
1	400	Stirling	150
2	400	Wickes	150
2	250	Wickes	165
2	250	Wickes	150
1	300	Wickes	150
1	225	Geary	150
1	250	B. & W.	125
2	210	B. & W.	125
1	125	Scotch Marine	125
1	78 x 20	H.R.T.	135
8	72 x 18	H.R.T.	125
2	84 x 18	H.R.T.	100
2	66 x 16	H.R.T.	125
2	66 x 16	H.R.T.	80
1	500	B. & W. Steel header	180

STEEL STACKS

3—39 in. x 75 ft. 1—60 in. x 92 ft. 6—36 in. x 60 ft.
1—14 x 36 R. H. Corliss Engine.

We invite your inspection of any of the equipment we have in stock. Inspections can be made at any time. Quotations are made for prompt acceptance and subject to prior sale.

Let us handle your boiler requirements. We overcome high prices and slow deliveries on new boilers. Purchase now and take advantage of this stock which is moving rapidly.

Write or Wire Sales Dept. for specifications and quotations also when you have boilers for sale.

J. F. DAVIS Phone Central 1494, 1122-24 Harris Trust Building, Chicago

Buyers' Guide—What and Where to Buy

Equipment, Apparatus, Supplies and Raw Materials Used by the Paper Industry

DYESTUFFS
Binney & Smith, 81-83 Fulton St., N. Y. City.
E. I. Du Pont de Nemours & Co., Wilmington, Del.
Geigy Co., Inc., 89 Barclay St., New York City.
National Aniline & Chem. Co., 21 Burling Slip, New York City.
The Newport Chemical Works, Inc., Passaic, N. J.
The White Tar Aniline Corp., 56 Vesey St., New York City.

DUST COLLECTING SYSTEMS
Bayley Mfg. Co., 732 Greenbush St., Milwaukee, Wis.

ELECTRIC HOISTS
John F. Byers Machine Co., Ravenna, Ohio.
Link-Belt Co., Chicago, Ill.
Northern Engineering Co., Detroit, Mich.

ELECTRIC MACHINERY
Westinghouse Elec. & Mfg. Co. East Pittsburgh, Pa.

ELEVATORS
The Jeffrey Mfg. Co., Columbus, O.

ELEVATORS (Portable)
The Jeffrey Mfg. Co., Columbus, O.

ENGINES
Ball Engine Co., Erie, Pa.
The Brownell Co., Dayton, O.
Chandler and Taylor, Indianapolis, Ind.

ENGINEERS
B. M. Baxter, 5716 Euclid Ave., Cleveland, O.
James L. Carey, 208 North Laramie St., Chicago, Ill.
John F. Carrigan, Chicago, Ill.
George F. Hardy, 309 Brodway, New York City.
Hardy S. Ferguson, 200 Fifth Ave., New York City.
H. B. Prather, Kirby Bldg., Cleveland, O.
Stebbins Engineering & Mfg. Co., Watertown, N. Y.

ENGINEERS (Testing)
Widney Test Laboratories, Chicago, Ill.

EVAPORATORS:
Buffalo Foundry & Machine Co., Buffalo, N. Y.
Charles Ordway, 25 Church St., N. Y. City.
Swenson Evaporator Co., Chicago, Ill.
Zaremba Co., Buffalo, N. Y.

EXHAUSTERS
Glamorgan Pipe & Foundry Co., Lynchburg, Va.

FANS
American Blower Co., Detroit, Mich.
Bayley Mfg. Co., 732 Greenbush St., Milwaukee, Wis.

FEED WATER REGULATORS
Northern Equipment Co., Erie, Pa.

FELTS AND JACKETS
Albany Felt Co., Albany, N. Y.
Appleton Woolen Co., Appleton, Wis.
Fitchburg Duck Mills, Fitchburg, Mass.
F. C. Huyck & Sons, Albany, N. Y.
Lockport Felt Co., Newfane, N. Y.
Paper Trading Co., Boston, Mass.
Shuler and Benninghofen, Hamilton, Ohio.

FELT CLEANERS
G. B. Stock Grease & Oil Co., Port Huron, Mich.

FELT AND WIRE GUIDES
Huband and Nash, Menasha, Wis.
Moore & White Co., Philadelphia, Pa.

FIBROUS PEARL FILLER
Eastern Paper Makers' Chemical Co., Watertown, N. Y.
Paper Makers' Chemical Co., Easton, Pa., and Holyoke, Mass.
Western Paper Makers' Chemical Co., Kalamazoo, Mich.

FILTER (Continuous Suction)
Glamorgan Pipe & Foundry Co., Lynchburg, Va.

FILTERS (Pressure and Gravity)
Graver Corporation, East Chicago, Ind.
Hungerford & Terry, Inc., Philadelphia, Pa.

FIRE BRICK (Plastic)
L. S. Shaw & Co., 5716 Euclid Ave., Cleveland, O.

FLOORING
Jennison-Wright Co., Toledo, Ohio.

FLUID METERS
Bailey Meter Co., 2023 E. 46th St., Cleveland, Ohio.

FOURDRINIER WIRES
Appleton Wire Works, Appleton, Wis.
Cheney Bigelow Wire Works, Springfield, Mass.
Eastwood Wire Mfg. Co., Belleville, N. J.
Lindsay Wire Weaving Co., Cleveland, Ohio.
The W. S. Tyler Co., Cleveland, Ohio.
Wisconsin Wire Works, Appleton, Wis.

FRICTION CLUTCHES
The Hill Clutch Co., Cleveland, Ohio.
Moore and White Co., Philadelphia, Pa.

FURNACE ARCHES
McLeod & Henry Co., Troy, N. Y.

FUSES
Economy Fuse & Mfg. Co., Kinzie and Orleans Sts., Chicago, Ill.

GEARS
The Hill Clutch Co., Cleveland, Ohio.

GLUES
E. F. Russ Co., 201 Devonshire St., Boston, Mass.

GRATE BARS
L. S. Shaw & Co., 5716 Euclid Ave., Cleveland, O.

GREASES
G. B. Stock Xylite Grease & Oil Co., Port Huron, Mich.

GRINDERS
The Bagley & Sewall Co., Watertown, N. Y.
Glens Falls Machine Works, Glens Falls, N. Y.
Holyoke Machine Co., Holyoke, Mass.
Valley Iron Works, Appleton, Wis.

HEATERS (Feed Water)
Graver Corporation, East Chicago, Ind.

HOISTING AND CONVEYING SYSTEMS
John F. Byers Machine Co., Ravenna, Ohio.
The Chisholm-Moore Mfg. Co., Cleveland, Ohio.
The Jeffrey Mfg. Co., Columbus, O.
Link-Belt Co., Chicago, Ill.
Northern Engineering Co., Detroit, Mich.
Robins Conveying Belt Co., New York City.

HOISTS (Coal and Ash)
R. H. Beaumont Co., Philadelphia, Pa.

HYDRAULIC TURBINES
Dominion Engineering Works, Ltd., Montreal, Quebec.
Holyoke Machine Co., Holyoke, Mass.
James Leffel and Co., Springfield, Ohio.
S. Morgan Smith Co., York, Pa.

INSTRUMENTS (Fluid Meter)
Bailey Meter Co., 2023 E. 46th St., Cleveland, Ohio.

INSTRUMENTS (Testing)
Widney Test Laboratories, Chicago, Ill.

IRON CASTINGS
Beloit Iron Works, Beloit, Wis.
Valley Iron Works Co., Appleton, Wis.

JORDAN FILLINGS
J. W. Bolton & Sons, Inc., Lawrence, Mass.

KNIVES
E. C. Atkins & Co., Indianapolis, Ind.
John W. Bolton & Sons, Inc., Lawrence, Mass.
Simonds Manufacturing Co., Fitchburg, Mass.

LAYBOYS
Moore and White Co., Philadelphia, Pa.

KNIFE GRINDING MACHINERY
Machinery Co. of America, Big Rapids, Mich.

LIFT TRUCKS
The Service Caster & Truck Co., Kansas City, Mo.

LIGHTING EQUIPMENT
Benjamin Electric Co., Chicago, Ill.

LINE SHAFT BEARINGS
The Hill Clutch Co., Cleveland, Ohio.

MACHINE DRYER TEMP. CONTROL
Open Coil Heater and Purifier Co., Indianapolis, Ind.
Valley Iron Works, Appleton, Wis.

MECHANICAL DRAFT APPARATUS
American Blower Co., Detroit, Mich.
Bayley Mfg. Co., 732 Greenbush St., Milwaukee, Wis.

MECHANICAL PULP
J. Andersen & Co., 21 E. 40th St., New York City.

MECHANICAL STOKERS
Sanford Riley Stoker Co., Worcester, Mass.

METAL PROTECTIVE PAINT
Detroit Graphite Co., 503 12th St., Detroit, Mich.

METERS (Fluid)
Bailey Meter Co., 2023 E. 46th St., Cleveland, Ohio.

METERS (Gasoline)
Wayne Oil Tank & Pump Co., Ft. Wayne, Ind.

MILL ARCHITECTS
Stebbins Engineering & Mfg. Co., Watertown, N. Y.

MIXING SYSTEM
Trimbey & Allen, Glens Falls, N. Y.

MILL WHITE
Detroit Graphite Co., 503 12th St., Detroit, Mich.
Tropical Paint & Oil Co., Cleveland, Ohio.
Vortex Mfg. Co., Cleveland, Ohio.

MOTORS
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.

OIL FILTRATIONS & CIRCULATING SYSTEMS
Wayne Oil Tank & Pump Co., Ft. Wayne, Ind.

OIL HANDLING AND STORING EQUIPMENT
The Wayne Oil Tank & Pump Co., Ft. Wayne, Ind.

PAINTS
Cheesman-Elliot Co., Inc., Brooklyn, N. Y.
Detroit Graphite Co., Detroit, Mich.
The Tropical Paint & Oil Co., Cleveland, O.
Vortex Mfg. Co., Cleveland, Ohio.

PAINT GUN
Vortex Mfg. Co., Cleveland, Ohio.

PAPER BOARDS
The C. L. La Boiteaux Co., 200 Fifth Ave., N. Y.
Strehl Otens Co., Inc., New York-Chicago.

PAPER CUTTERS & SLITTERS
Beloit Iron Works, Beloit, Wis.
Hamblet Machine Co., Lawrence, Mass.

PAPER DISTRIBUTORS
Bermingham and Prosser, Chicago, Ill.
H. G. Craig & Co., New York City.
Berton C. Hill Co., New York City.
Mills Pulp & Paper Co., Conway Bldg., Chicago.
Maurice O'Meara, New York City.
Seaman Paper Co., Chicago, Ill.

PAPER EXPORTERS AND IMPORTERS
E. J. Keller Company, 200 Fifth Ave., N. Y. C.
Main Paper Stock Co., 23-31 Peck Slip, New York City.
New York Overseas Co., 17 Battery Place, New York City.
Interstate Pulp and Paper Co., Grand Central Bldg., New York City.
Lagerloef Trading Co., 18 E. 41st St., N. Y. C.
Parsons Trading Co., 17 Battery Place, N. Y. C.
Storm & Bull, 114 Liberty St., New York City.

PAPER MACHINES
The Bagley & Sewall Co., Watertown, N. Y.
Beloit Iron Works, Beloit, Wis.
The Black-Clawson Co., Hamilton, O.
Dominion Engineering Works, Ltd., Montreal, Quebec.

PAPER MANUFACTURERS
Bardeen Paper Co., Otsego, Mich.
Eastern Manufacturing Co., 501 Fifth Ave., N. Y. City.
Hammermill Paper Co., Erie, Pa.
Lincoln Paper Mills, Elkhart, Ind.
Marathon Paper Co., Rothschild, Wis.
Munising Paper Co., Munising, Mich.
Northern Paper Mills, Green Bay, Wis.
Oxford Paper Co., 200 Fifth Ave., N. Y. City.
State Pulp & Paper Co., New York City.
Ticonderoga Pulp & Paper Co., 522 Fifth Ave., New York City.
Wausau Sulphate Fibre Co., Mosinee, Wis.
Wolverine Paper Co., Otsego, Mich.

PAPER MANUFACTURERS' SUPPLIES
J. Andersen & Co., 21 East 40th St., New York City.
The Robert Andrews Co., 115-117 Franklin St., New York City.
Vito G. Cantasano & Bros., 185 South St., New York City.
Craig-Becker Co., 52 Vanderbilt Ave., N. Y. City.
Dallas Waste Mills, 130 Pearl St., New York City.
Detroit Chemical Works, Detroit, Mich.
Diamond Alkali Co., Pittsburgh, Pa.
Eastern Paper Makers' Chemical Co., Watertown, N. Y.
Invincible Paper & Pulp Corporation, 135 Broadway, N. Y. City.
E. J. Keller Company, 200 Fifth Ave., N. Y. C.
Main Paper Stock Co., 25 Spruce St., New York City.
Mendelson Bros. Paper Stock Co., 910 Michigan Ave., Chicago.
New York Overseas Co., Inc., 17 Battery Place, New York City.
Paper Makers' Chemical Co., St. Austell, England.
Paper Trading Co., Boston, Mass.
Pennsylvania Salt Mfg. Co., Philadelphia, Pa.
A. Salomon, Inc., New York City.
Salomon Bros. & Co., 200 Fifth Ave., N. Y. C.
Steele By-Products Co., Chicago.
Western Paper Makers' Chemical Co., Kalamazoo, Mich.

PAPER MILL BROKERS
Gibbs-Brower Co., 261 Broadway, N. Y. C.

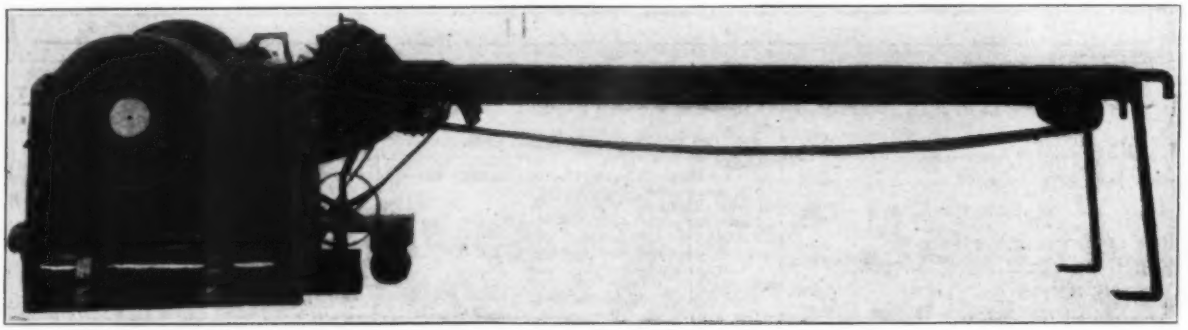
PAPER STOCK CUTTERS
Taylor, Stiles & Co., Riegelsville, N. J.

PAPER AND PULP MILL MACHINERY
Beloit Iron Works, Beloit, Wis.
The Black-Clawson Co., Hamilton, O.
The Sandy Hill Iron & Brass Works, Hudson Falls, N. Y.

PAPER TESTERS
Widney Test Laboratories, Chicago, Ill.

PARCHMENT MANUFACTURERS
Kalamazoo Vegetable Parchment Co., Kalamazoo, Mich.
Sutherland Paper Co., Kalamazoo, Mich.

No. 11 "GIANT" PAPER STOCK CUTTER



Capacity 2½ Tons Per Hour
Especially Adapted for Handling Waste Paper, Magazines, Etc., Before Feeding to the Beaters

Whatever You Cut, A GIANT Will Solve Your Problem

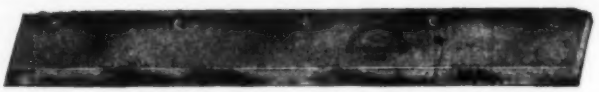
LET US FIGURE IT OUT FOR YOU

TAYLOR, STILES & COMPANY, Riegelsville, N. J., U.S.A.

WATEROUS ENGINE WORKS
Brantford, Ont., Canada
Canadian Representatives

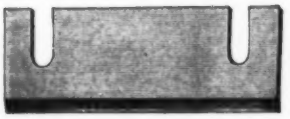
R. J. MARX
133 Finsbury Pavement, London E. C.
Sole Agents for Europe

SIMONDS KNIVES



ALL the essential qualities that go to make up an efficient cutting service are found in Simonds celebrated knives for Paper Mills, Pulp Mills and Printers. The steel, the temper and the cutting edge of all Simonds Knives are uniform, and the knife is backed by expert workmanship.

Barker, Chipper, Paper Cutting Knives and Circular Cutters are a few of the edge-holding products which are produced in Simonds Factories.



Write for Prices and Catalog

Simonds Manufacturing Co.
"The Saw Makers"

Fitchburg, Mass.
5 Factories

Chicago, Ill.
12 Branches

Buyers' Guide—What and Where to Buy

Equipment, Apparatus, Supplies and Raw Materials Used by the Paper Industry

PERFORATED METALS
Harrington & King Perforating Co., 615 No. Union Ave., Chicago.
Charles Mundt & Sons, 57 Fairmount Ave., Jersey City, N. J.

PIPE BENDING
American Pipe Bending Co., Boston, Mass.

PIPING EQUIPMENT
Pittsburgh Piping & Equip. Co., Pittsburgh, Pa.

PIPING SYSTEMS INSTALLED
Pittsburgh Piping & Equip. Co., Pittsburgh, Pa.

PIPE THREADING & CUTTING MACHINERY
Toledo Pipe Threading Machine Co., Toledo, O.

PLUG MACHINES
Carthage Machine Co., Carthage, N. Y.

PNEUMATIC CHIP HANDLING SYSTEMS
Bayley Mfg. Co., 732 Greenbush St., Milwaukee, Wis.

POWER TRANSMISSION
Dodge Sales & Engineering Co., Mishawaka, Ind.
Link-Belt Co., Chicago, Ill.
The Hill Clutch Co., Cleveland, Ohio.
Rodney Hunt Machine Co., 45 Mill St., Orange, Mass.
Valley Iron Works, Williamsport, Pa.

PRESSURE GOVERNORS
Northern Equipment Co., Erie, Pa.

PULP (Chemical)
J. Andersen & Co., 21 East 40th St., New York City.
Craig-Becker Co., 52 Vanderbilt Ave., N. Y. City.
M. Gottesman & Co., 18 E. 41st St., New York City.
Daniel M. Hicks, 200 Fifth Ave., New York City.
E. J. Keller Company, 200 Fifth Ave., N. Y. C.
New York Overseas Co., Inc., 17 Battery Place, New York City.
Price & Pierce, Ltd., 30 East 42nd St., New York City.
The Pulp & Paper Trading Co., 21 East 40th St., New York City.
Scandinavian-American Trading Co., 50 East 42d St., New York City.
Lagerloef Trading Co., 18 E. 41st St., N. Y. C.

PULP EXTRACTORS
The Griley-Unkle Eng. Co., Ft. Wayne, Ind.

PULP AND PAPER MACHINERY
Beloit Iron Works, Beloit, Wis.
Bird Machine Co., East Walpole, Mass.
Carthage Machine Co., Carthage, N. Y.
Glens Falls Machine Co., Glens Falls, N. Y.
Green Bay Foundry & Mach. Works, Green Bay, Wis.
Moore & White Co., Philadelphia, Pa.
Union Iron Works, Bangor, Me.
Valley Iron Works, Appleton, Wis.

PULP GRINDERS
Carthage Machine Co., Carthage, N. Y.
Glens Falls Machine Works, Glens Falls, N. Y.
Union Iron Works, Bangor, Me.

PULP MILL BROKERS
Gibbs-Brower Co., 261 Broadway, N. Y. C.

PULP LAP SHREDDERS
The Jeffrey Mfg. Co., Columbus, O.

PULP SHREDDERS
Carthage Machine Co., Carthage, N. Y.

PUMPS (Stock)
Beloit Iron Works, Beloit, Wis.
Buffalo Steam Pump Co., Buffalo, N. Y.
Carthage Machine Co., Carthage, N. Y.
Glens Falls Machine Co., Glens Falls, N. Y.

PUMPS (Centrifugal)
Manistee Iron Works Co., Manistee, Mich.

PUMPS (Deep Well)
Gregg Pump Co., Kansas City, Mo.

PUMPS (Gasoline)
Wayne Oil Tank & Pump Co., Ft. Wayne, Ind.

PUMPS (Vacuum)
American Steam Pump Co., Battle Creek, Mich.
Buffalo Foundry and Machine Co., Buffalo, N. Y.
Dean Bros., Indianapolis, Ind.

RAG AND PAPER DUSTERS
Holyoke Machine Co., Holyoke, Mass.

RAG CUTTERS
B. F. Perkins & Son, Inc., Holyoke, Mass.

REFLECTORS
Beniamin Electric Co., Chicago, Ill.

REGULATORS (Boiler Feed)
Northern Equipment Co., Erie, Pa.

REGULATORS (Feed Water)
Northern Equipment Co., Erie, Pa.

ROTARY JET CONDENSORS
Manistee Iron Works Co., Manistee, Mich.

ROTARY VACUUM PUMPS
Sandusky Foundry & Machine Co., Sandusky, O.

RUBBER ROLLS
The American Wringer Co., Woonsocket, R. I.

ROTARY SCREEN
Bird Machine Co., East Walpole, Mass.

SAVE-ALLS
Bird Machine Co., East Walpole, Mass.
Glens Falls Machine Co., Glens Falls, N. Y.

SAWS
E. C. Atkins & Co, Indianapolis, Ind.
Simonds Manufacturing Co. Fitchburg, Mass.

SCREENS
The Bagley & Sewall Co., Watertown, N. Y.
Bird Machine Co., East Walpole, Mass.
Shartle Bros. Mach. Co., Middletown, O.
Union Iron Works, Bangor, Me.

SCREEN PLATES
Central Mfg. Co., Kalamazoo, Mich.
William A. Hardy & Sons, Fitchburg, Mass.
Union Screen Plate Co., Fitchburg, Mass.

SHOWER PIPES
Sandusky Foundry and Machine Co., Sandusky, Ohio.

SILENT CHAIN DRIVES
The Link Belt Co., Chicago, Ill.

SIZING SYSTEMS
Eastern Paper Makers' Chemical Co., Watertown, N. Y.
Paper Makers' Chemical Co., Easton, Pa., and Holyoke, Mass.
Process Engineers, New York City.
Western Paper Makers' Chemical Co., Kalamazoo, Mich.

SLITTING AND REWINDING MACHINERY
Beloit Iron Works, Beloit, Wis.
Cameron Machine Co., Poplar St., Brooklyn, N. Y.
Hamblet Machine Co., Lawrence, Mass.
Samuel M. Langston Co., Camden, N. J.
Meisel Press Mfg. Co., 948 Dorchester, Ave., Boston 25, Mass.

SOOT BLOWERS
Diamond Power Specialty Co., Detroit, Mich.
L. S. Shaw & Co., 5716 Euclid Ave., Cleveland, O.

SODA ASH
Diamond Alkali Co., Pittsburgh, Pa.

SPEED CHANGES
Moore and White Co., Philadelphia, Pa.

SPEED REDUCERS
Wm. Ganchow Co., Chicago, Ill.

STEAM TRAPS
The Ellis Drier Co., 332 S. La Salle St., Chicago.
L. S. Shaw & Co., 5716 Euclid Ave., Cleveland, O.

STOCK CIRCULATING SYSTEM
Claflin Engineering Co., Lancaster, Ohio.
Ticonderoga Machine Works, Ticonderoga, N.Y.

STOCK METER
Trimbey & Allen, Glens Falls, N. Y.

STOCK PUMPS
The Bagley & Sewall Co., Watertown, N. Y.
Beloit Iron Works, Beloit, Wis.
Buffalo Steam Pump Co., Buffalo, N. Y.

STRAWBOARD AND PAPER (Foreign)
Labonte & Grieff, Rotterdam, Holland.

SUCTION ROLLS
Sandusky Foundry and Machine Co., Sandusky, Ohio.

SULPHITE MACHINERY
Stebbins Engineering Co., Watertown, N. Y.

SULPHITE PULP
Riordan Sales Co., Montreal, Canada.

SULPHUR
Union Sulphur Co., 17 Battery Place, New York City.

SULPHUR BURNERS
Carthage Machine Co., Carthage, N. Y.
Glens Falls Machine Works, Glens Falls, N. Y.
Valley Iron Works Co., Appleton, Wis.

TANKS (Oil Storage)
Wayne Oil Tank & Pump Co., Ft. Wayne, Ind.
Graver Corporation, East Chicago, Ind.

TANKS (Steel)
Graver Corporation, East Chicago, Ind.

TANKS (Welded)
Wayne Oil Tank & Pump Co., Ft. Wayne, Ind.

TANKS (Water Storage)
Graver Corporation, East Chicago, Ind.

TRUCKS (Roll Handling)
The Elwell-Parker Elec. Co., Cleveland, Ohio.

TRUCKS (Industrial)
The Elwell-Parker Elec. Co., Cleveland, Ohio.
Service Caster & Truck Co., Kansas City, Mo.

TURBINES (Hydraulic)
James Leffel and Co., Springfield, Ohio.
S. Morgan Smith Co., York, Pa.

VACUUM PUMPS
Nash Eng. Co., South Norwalk, Conn.

VACUUM SYSTEMS
Open Coil Heater and Purifier Co., Indianapolis, Ind.

VALVES
Carthage Machine Co., Carthage, N. Y.
The Crane Co., Chicago, Ill.
G. M. Davis Regulator Co., 414 Milwaukee Ave., Chicago, Ill.
Golden-Anderson Valve Spec. Co., 1203 Fulton Bldg., Pittsburgh, Pa.
The Wm. Powell Co., Cincinnati, Ohio.

VALVES (Pump)
Voorhees Rubber Mfg. Co., Jersey City, N. J.

VALVES (Strainer)
Bird Machine Co., East Walpole, Mass.

VAPOR ABSORPTION SYSTEMS
American Blower Co., Detroit, Mich.
Bayley Mfg. Co., 732 Greenbush St., Milwaukee, Wis.

VARIABLE SPEED ENGINES
Ball Engine Co., Erie, Pa.
The Brownell Co., Dayton, Ohio.
Chandler and Taylor, Indianapolis, Ind.

VENTILATING SYSTEMS
American Blower Co., Detroit, Mich.
Bayley Mfg. Co., 732 Greenbush St., Milwaukee, Wis.
B. F. Perkins & Son, Inc., Holyoke, Mass.
kee, Wis.

WASHER WIRES
The W. S. Tyler Co., Cleveland, Ohio.

WASTE PAPER STOCK
Main Paper Stock Co., 21-31 Peck Slip, New York City.
Mendelson Bros. Paper Stock Co., 910 S. Michigan Blvd., Chicago, Ill.
Salomon Bros. & Co., 200 Fifth Ave., N. Y. C.

WATCHMAN'S CLOCKS
Chicago Watchman's Clock Works, 1526 Wabash Ave., Chicago.
Hardinge Bros., Inc., 1771 Berteau Ave., Chicago, Ill.

WATER FILTER
Glens Falls Machine Co, Glens Falls, N. Y.
Hungerford & Terry, Inc., Philadelphia, Pa.

WATER HEATERS:
Graver Corporation, East Chicago, Ill.

WATER POWER EQUIPMENT
Rodney Hunt Mach. Co., 45 Mill St., Orange, Mass.

WATER REGULATORS (Feed)
Northern Equipment Co., Erie, Pa.

WATERPROOF LINING
The National Waterproofing Co., Philadelphia, Pa.

WATER-SOFTENING AND PURIFYING SYSTEMS
Graver Corporation, East Chicago, Ind.
Wm. B. Scaife and Sons Co., Oakmont, Pa.

WATER WHEELS
James Leffel and Co., Springfield, Ohio.
Holyoke Machine Co., Holyoke, Mass.
S. Morgan Smith Co., York, Pa.

WELDING & CUTTING EQUIPMENT
The Imperial Brass Mfg. Co., 516 So. Racine Ave., Chicago.

WET MACHINES
The Bagley & Sewall Co., Watertown, N. Y.
Carthage Machine Co., Carthage, N. Y.
Glens Falls Machine Works, Glens Falls, N. Y.
Valley Iron Works Co., Appleton, Wis.

WOOD BLOCKS
Jennison-Wright Co., Toledo, Ohio.

WOOD CHIP SHREDDERS
The Jeffrey Mfg. Co., Columbus, O.

WOOD PIPE
The Michigan Pipe Co., Dept. 17, Bay City, Mich.
A. Wyckoff & Son Co., Elmira, N. Y.

WOOD ROLLS
Rodney Hunt Mach. Co., 45 Mill St., Orange, Mass.

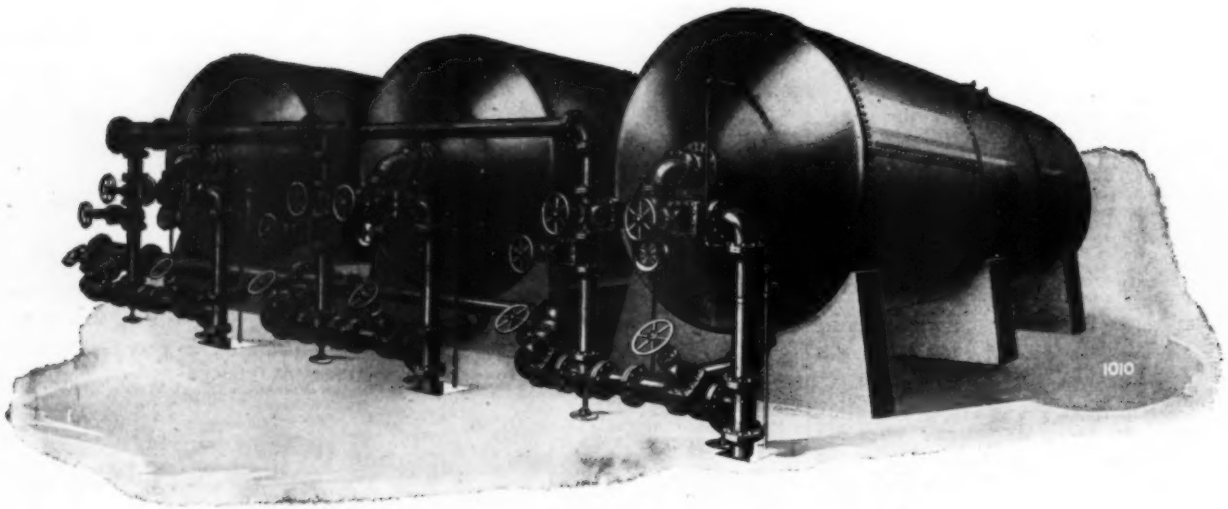
WOOD SPLITTERS
Carthage Machine Co., Carthage, N. Y.

WOOD WASHERS
Carthage Machine Co., Carthage, N. Y.

WIRE SIGNS
Cheney Bigelow Wire Works, Springfield, Mass.

GRAVER
Water
Softening & Purification
HEADQUARTERS

GRAVER *Filters*



Graver Water Filters will deliver properly clarified water to meet every demand.

Graver Service begins with filling your request for information, extends through the analysis of your water conditions, provides for the proper installation and starting of the correct equipment, and continues throughout the full term use of the equipment.

Write for further information regarding the various types of Graver Filters.

GRAVER *Corporation*

(WM. GRAVER TANK WORKS · FOUNDED 1857)

Steel Tanks and General Steel Plate Construction
Water Softening and Purifying Equipment

7-H

East Chicago, Indiana

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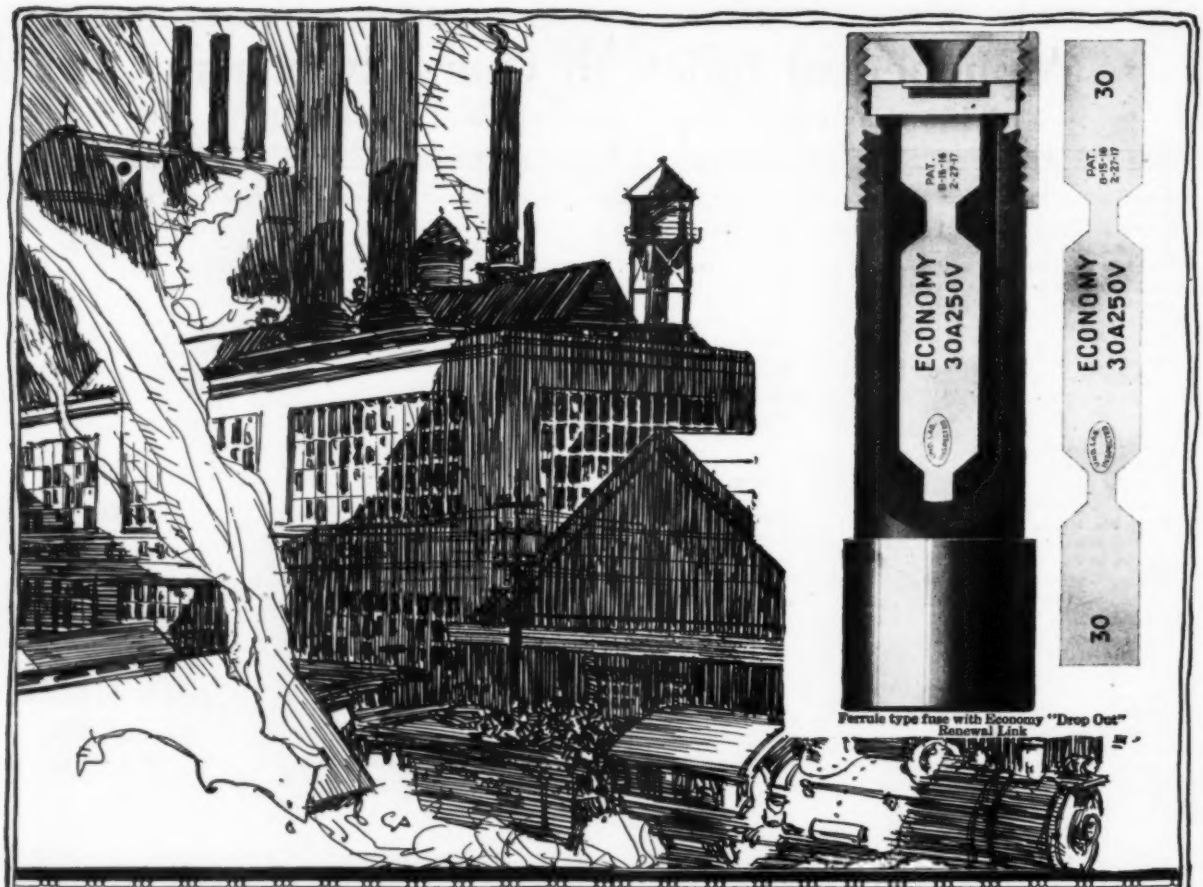

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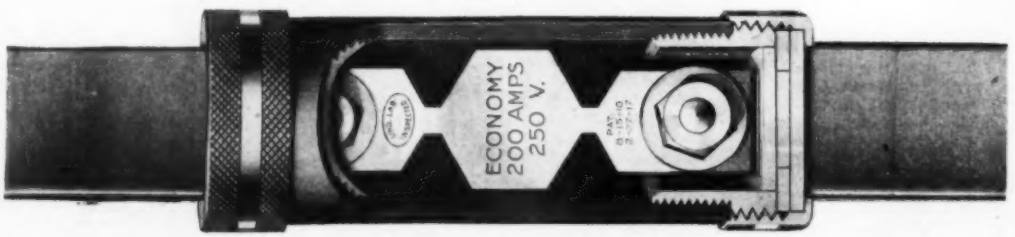

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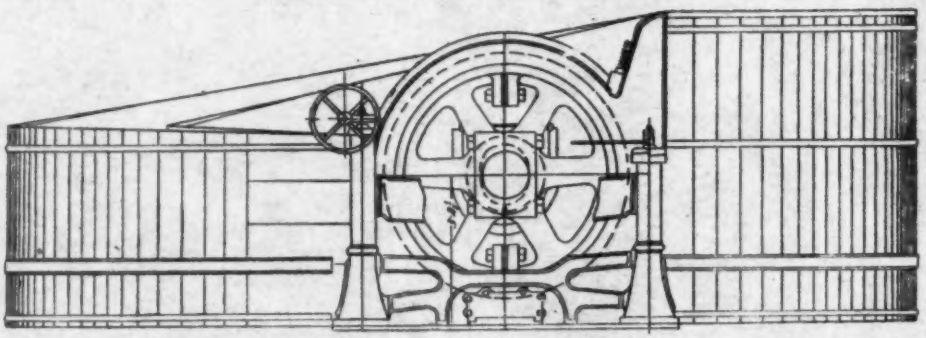

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